Supplementary Geotechnical and Geo-Environmental Site Investigation Report:

Proposed Residential Development at the Former Afan Lido, The Princess Margaret Way, Port Talbot

PREPARED FOR:

Persimmon Homes West Wales

February 2020

Job No: 14647/1



terrafirma

REPORT TITLE	**:**	**Supplementary Geotechnical and Geo-Environmental Site Investigation Report:** Proposed Residential Development at the Former Afan Lido, The Princess Margaret Way, Port Talbot
REPORT STATUS	**:**	**Final**
REVISION	**:**	**1**
JOB NUMBER	**:**	**14647/1**
DATE	**:**	**February 2020**
PREPARED BY	**:**	…….. **Mr Michael Watkins**
REVIEWED BY	**:**	…….. **Mrs Ruth Howells**
APPROVED BY	**:**	…….. **Dr Gwyn C Lake**

Executive Summary

Introduction & Proposed Development	*Persimmon Homes West Wales is proposing a residential development at the former Afan Lido on The Princess Margaret Way in Port Talbot.*
Site Location	*The site is located off The Princess Margaret Way, Port Talbot, and is centred on a National Grid Reference of 274730 189450.*
Ground Conditions	*MADE GROUND: Variable composition including soils dominated by building rubble, re-worked natural soils, granular soils dominated by slag, ash and clinker.* *BLOWN SAND: Loose to medium dense pale brown, orange brown to yellow brown slightly silty fine to medium SAND with occasional cemented laminae and rare coarse gravel size grey mudstone and shell fragments.* *TIDAL FLAT DEPOSITS: Interlayered sand, silt and clay units, which locally form distinct lenses or beds several metres thick but are interlaminated with sand, silt and clay.* *MARINE BEACH DEPOSITS: Dense grey clayey silty sandy Gravel with medium cobble content.* *GLACIAL DEPOSITS: Very stiff to hard dark grey to greyish brown slightly sandy gravelly clay.*
Laboratory Chemical Testing	*No asbestos was recorded in any of the 4 additional samples taken from beneath the floor slab of the demolished Afan Lido building.*
Soakaway Testing	*Infiltration Rates of between 3.59 x 10^{-5} and 1.29 x 10^{-4} and were recorded.*
Ground Gas Monitoring	*The site is preliminarily classified as 'gas characteristic situation 1'. Following the completion of the remaining gas monitoring, a final ground gas risk assessment will be determined.*
Slag Expansion Testing	*Thomas Research Services (TRS) Limited undertook a petrological examination of three slag-containing soil samples taken from the site.* *No normal blast furnace slag, basic steel slag or basic refractory material was seen in any of the samples. As such, no expansion testing is recommended on these samples.*

TABLE OF CONTENTS

SECTION 1 Introduction and Proposed Development

1.1 Introduction
1.2 Limitations and Exceptions of Investigation

SECTION 2 Review of Existing Data

2.1 Physical Setting, Current Use and Site Conditions
2.2 Previous Investigations

SECTION 3 Field Investigation

3.1 Site Works
3.2 Exploratory Strategy
3.3 Ground Conditions
3.4 Monitoring Well Installation Details
3.5 Laboratory Chemical Testing
3.5.1 Quality Assurance
3.5.2 Sampling Regime
3.5.3 Laboratory Soil Analysis
3.6 Soakaway Testing
3.7 Dynamic Cone Penetrometer Testing
3.8 Ground Gas Monitoring
3.9 Groundwater Level Monitoring
3.10 Slag Expansion Testing

SECTION 4 Evaluation of Soil Analytical Results

4.1 Asbestos

SECTION 5 Evaluation of Soil Leachate Analytical Results

5.1 Soil Leachate Assessment Methodology
5.2 Soil Leachate Test Results

SECTION 6 Soakaway Testing

SECTION 7 Preliminary Ground Gas Risk Assessment

SECTION 8 Groundwater Level Monitoring

SECTION 9 Slag Expansion Testing

SECTION 10 Quantitative Risk Assessment

10.1 Leachable Contaminants of Concern
10.2 Potential Receptors and Pathways
10.2.1 Aquatic Environment

TABLE OF CONTENTS (Continued)

Tables

Table 3.1 Summary of Ground Conditions
Table 3.2 Well Installations
Table 3.3 Sample Locations and Depths
Table 4.1 Summary of Soil Asbestos Screen
Table 5.1 Summary of Groundwater Chemical Test Results – Standard Suites
Table 5.2 Summary of Groundwater Chemical Test Results – Polyaromatic Hydrocarbons
Table 6.1 Soakaway Test Results
Table 10.1 Summary of Soil Leachate Chemical Exceedances

Figures

Figure 2.1 Site Location – Ordnance Survey Map (Not to Scale)

Annexes

Annex A Clarke Bond Phase 1 Geoenvironmental Assessment
Annex B Hyder Ground Investigation Report
Annex C Trial Pit Logs
Annex D Laboratory Soil Chemical Test Results
Annex E Laboratory Soil Leachate Chemical Test Results
Annex F In-situ Soakaway Test Results
Annex G Gas Monitoring Results
Annex H Groundwater Monitoring Data
Annex I Thomas Research Services Report

SECTION 1 Introduction and Proposed Development

1.1 Introduction

Persimmon Homes West Wales (hereafter known as the Client) is proposing a residential development at the former Afan Lido on The Princess Margaret Way in Port Talbot.

Terra Firma (Wales) Limited have been commissioned to undertake a supplementary investigation following Hyder Consulting (UK) Limited's Ground Investigation Report of the site, undertaken in July 2015.

Hyder's report recommended that the entire site should be capped due to elevated concentrations of several contaminants including inorganic and organic compounds and asbestos. The report also recommended shallow spread footings within the Blown Sands. The findings of Hyder's report are discussed further in Section 2.2.

The main objectives of the supplementary geo-environmental assessment programme were to:

- Test samples of the soil beneath the floor slab of the former Afan Lido building for asbestos
- Determine the risk posed by ground gas at the site and provide recommendations in relation to gas protection measures if necessary

The main objectives of the geotechnical site investigation were to:

- Undertake soakaway testing across the site
- Monitor groundwater level and determine whether groundwater level is influenced by the tide
- Determine whether the slag deposits at the site are expansive

In order to achieve the above objectives, Terra Firma (Wales) Limited carried out an assessment programme including a field investigation to collect geotechnical and environmental data from selected locations.

1.2 Limitations and Exceptions of Investigation

The Client has requested that a supplementary Geo-environmental Site Assessment (GSA) and Geotechnical Investigation (GI) is undertaken.

The GSA and GI were conducted and this report has been prepared for the sole internal reliance of the Client and its design and construction team. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Terra Firma (Wales) Limited. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill. The report represents the findings and opinions of experienced geo-environmental and geotechnical consultants. Terra Firma (Wales) Limited does not provide legal advice and the advice of lawyers may be required.

The subsurface geological profiles, any contamination and other plots are generalised by necessity and have been based on the information found at the locations of the exploratory holes and depths sampled and tested.

The site investigation was limited by underground services, car park and the footprint of the former building.

SECTION 2 Review of Existing Data

2.1 Physical Setting, Current Use and Site Conditions

The site is located off The Princess Margaret Way, Port Talbot, and is centred on a National Grid Reference of 274730 189450. The location of the site is shown below in **Figure 2.1.**

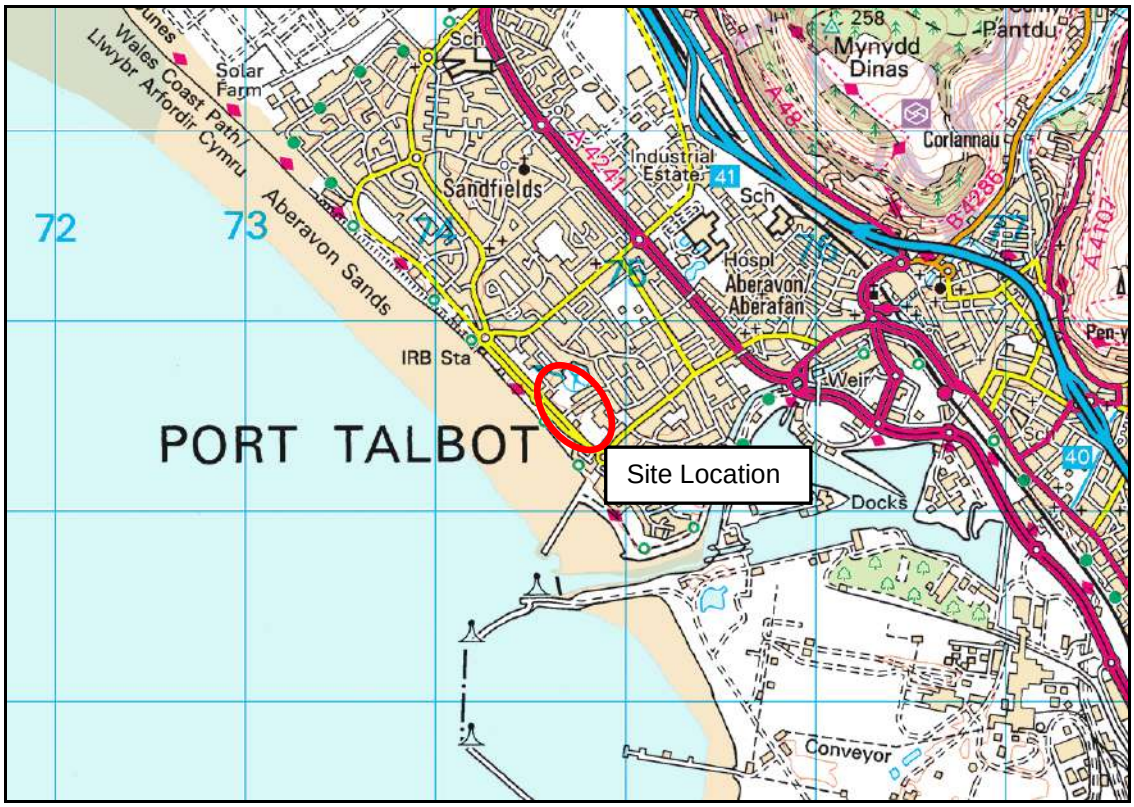


Figure 2.1: Site Location Ordnance Survey Map (Not to Scale)

The site is split into two areas by Channel View, which cuts through the centre of the site from northeast to southwest. The northwest of the site is derelict following the demolition of the former lido. To the immediate southeast of Channel View is a small car park, beyond which is a large patch of empty land, which is often used for overflow car parking.

The site and surrounding area is generally flat.

2.2 Previous Investigations

Clarke Bond and Hyder Consulting (UK) Limited carried out a desk study (WB03278/R1) dated 14th October 2013, and site investigation (report ref UA007442-001-R001) dated July 2015 respectively.

The intrusive investigations consisted of three light cable percussion boreholes, nine windowless sample boreholes, and seventeen trial pits. The ground conditions encountered were made ground of 0.12/2.9m thickness, above Blown Sand of 5.7/10.9m thickness and either Tidal Flat deposits of 9.0/14.1m thickness, or Till of 7.93 to 10.06m.

Chemical testing of a broad suite of determinants recorded concentrations of arsenic, cadmium, lead, zinc, benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene above their soil guidelines values/generic assessment criteria for a residential scenario. Asbestos was also recorded.

A ground gas risk assessment indicated that the site is considered to be Gas Characteristic Situation 1; i.e. very low risk, however the programme was limited to between only 2 or 3 visits.

Shallow spread foundations were recommended for low-rise buildings (1-4 storeys) provided they are founded in the Blown Sand, and where the depth of foundation is at least 0.9m below the finished ground level. An allowable bearing resistance of 80kPa was recommended.

Copies of Clarke Bond and Hyder's reports are located in **Annex A** and **Annex B** respectively.

SECTION 3 Field Investigation

3.1 Site Works

A supplementary geotechnical and geo-environmental site investigation comprising eleven machine excavated trial pits was undertaken between the 27th January and 30th January and 19th February 2020.

The trial pits were excavated with a JCB 3CX mechanical excavator with a two-foot toothed bucket.

The fieldworks were supervised by Terra Firma (Wales) Limited, who logged the exploratory holes to the requirements of BS5930:2015. The locations of the exploratory holes were determined by Terra Firma (Wales) Limited.

The trial pit logs are presented in **Annex C** and their locations are shown on **Drawing 01**.

3.2 Exploratory Strategy

Samples of the soil directly beneath the floor slab of the former Afan Lido building were taken.

3.3 Ground Conditions

The ground conditions encountered by the exploratory holes by both the Terra Firma (Wales) Limited investigation, and the Hyder site investigation can in general be summarised as shown in **Table 3.1**.

Table 3.1 Summary of Ground Conditions

Depth (m)			Thickness (m)	Stratum
GL	-	0.12/2.9	0.12/2.9	**MADE GROUND:** Variable composition including soils dominated by building rubble, re-worked natural soils, granular soils dominated by slag, ash and clinker.
0.12/2.9	-	6.6/13.8	5.7/10.9	**BLOWN SAND:** Loose to medium dense pale brown, orange brown to yellow brown slightly silty fine to medium **SAND** with occasional cemented laminae and rare coarse gravel size grey mudstone and shell fragments.
6.6/13.8	-	20.4/22.8	13.8/19.0	**TIDAL FLAT DEPOSITS:** Interlayered **SAND, SILT** and **CLAY** units, which locally form distinct lenses or beds several metres thick but are interlaminated with sand, silt and clay.
20.4/22.8	-	28.7	8.3/>4.65	**MARINE BEACH DEPOSITS**: Dense grey clayey silty sandy **GRAVEL** with medium cobble content.
28.7	-	>30.4	-	**GLACIAL DEPOSITS:** Very stiff to hard dark grey to greyish brown slightly sandy gravelly **CLAY.**

3.4 Monitoring Well Installation Details

Gas and groundwater monitoring wells installed by Hyder in 2015 were utilised for additional gas and groundwater level monitoring. **Table 3.2** provides the shallow well construction details, and their current condition.

Table 3.2 Well Installations

No.	Installation Depth (m)	Top of Installation	Remaining Installation	Current Well Depth
BH101	6.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 6.0m 50mm slotted pipe with gravel surround.	6.10m
BH102	7.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 7.0m 50mm slotted pipe with gravel surround.	7.04m
BH103	6.5	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 7.0m 50mm slotted pipe with gravel surround.	6.40m
WS143A	2.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 2.0m 50mm slotted pipe with gravel surround.	2.10m
WS144	5.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 5.0m 50mm slotted pipe with gravel surround.	4.85m
WS146	5.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 5.0m 50mm slotted pipe with gravel surround.	5.04m
WS147	5.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 5.0m 50mm slotted pipe with gravel surround.	5.04m
WS148	5.0	Ground level to 1.0m plain pipe (50mm) with bentonite surround.	1.00m to 5.0m 50mm slotted pipe with gravel surround.	Destroyed

3.5 Laboratory Chemical Testing

3.5.1 Quality Assurance

During the intrusive investigation undertaken by Terra Firma, 4 No. small disturbed soil samples were collected from beneath the floor slab of the former Afan Lido building. The samples were despatched to the laboratories of Chemtest for asbestos screening.

A copy of the laboratory soil chemical test results is presented in **Annex D**.

Care was taken to ensure that sampling quality assurance occurred during site works. This included the following measures:

- Soil samples were collected by hand with nitrile gloves.
- Clean gloves were used for each sample.
- Soil samples were stored at a temperature below 4 degrees.
- No head space was left in sample containers.
- Appropriate sample containers were used.
- Samples were submitted for laboratory testing within holding times.

3.5.2 Sampling Regime

The sampling regime was conducted in accordance with BS5930:2015 in order to satisfy the following criteria:

- Investigate suspected sources of contamination
- Investigate type and concentration of contamination
- Ensure good representation of the site
- Provide data to inform on remedial measures if necessary

The sample locations and depths are illustrated in the following table:

Table 3.3 Sample Locations and Depths

Sample	Depth (m)
TP07-2020	1.5
TP08-2020	1.2
TP09-2020	1.5
TP10-2020	1.5

3.6 Soakaway Testing

Six soakaway tests were undertaken in trial pits TP01-2020 to TP06-2020 to the requirements of BRE 365. Due to the instability of the Blown Sand and overlying made ground, 40mm stone infill was used to support the trial pit sides.

Following excavation of the pit to the required depth, a 50mm HDPE slotted pipe with filter sock was inserted into the pit, and the stone infill placed into the pit by the JCB 3CX's backhoe bucket.

The results of the soakaway testing are presented in **Annex E** and are discussed further in **Section 6**.

3.7 Ground Gas Monitoring

Following the investigation, a programme of in-situ gas monitoring for the presence of methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulphide, barometric pressure, pressure trend of the atmosphere and flow rate was implemented. The wells as described in Section 3.4 were utilised.

Two out of a proposed six rounds of gas monitoring have been undertaken thus far.

The gas monitoring results are discussed further in Section 7 of the report, and the results in their entirety are presented in **Annex F**.

3.8 Groundwater Level Monitoring

In order to determine the depth of the shallow groundwater beneath the site, the groundwater level was monitored. This was undertaken on a fortnightly basis. In addition to the fortnightly monitoring, a groundwater monitoring datalogger was installed within the shallow well at BH103 for a period of a week to determine whether the groundwater table falls and rises with the tide. The datalogger was installed over a period that included spring tide.

The groundwater monitoring data is presented in **Annex G**.

3.9 Slag Expansion Testing

Thomas Research Services (TRS) Limited undertook a petrological examination of three slag-containing soil samples taken from the site. The findings and conclusions are discussed in Section 9 of the report, and TRS's report in its entirety resented in **Annex H**.

SECTION 4 Evaluation of Soil Analytical Results

4.1 Asbestos

An asbestos screen was undertaken on four samples of the soil located directly beneath the floor slab of the former Afan Lido building. **Table 4.1** below summarises where the samples were taken and whether asbestos has been identified.

It should be noted that in the areas investigated, the floor slab was located directly upon the Blown Sand, and no made ground was recorded.

Table 4.1 Summary of Soil Asbestos Screen

Location	Depth (m)	Result and comment
TP07-2020	1.5	NAD
TP08-2020	1.2	NAD
TP09-2020	1.5	NAD
TP10-2020	1.5	NAD

SECTION 5 Evaluation of Soil Leachate Analytical Results

5.1 Soil Leachate Assessment Methodology

Due to elevated levels of some metals, metalloids, and polyaromatic hydrocarbons, six soil samples were taken from the made ground on 19th February 2020. Samples were dispatched to the laboratories of Chemtest.

Results have been compared to guidelines provided by the EU Water Framework Directive (2000/60/EC) (WFD).

Where WFD guidelines are not available thresholds provided by the EU Drinking Water Directive 98/83/EC (DWD) or drinking water standards set by the World Health Organisation (WHO) have been referred to.

The results are summarised in the following tables.

5.2 Soil Leachate Test Results

Table 5.1 Summary of Groundwater Chemical Test Results: Standard Suite

Substance	EQS (µg/l)	Source	Measured Concentrations of Tested Substances (µg /l)		Number of exceedances
			Minimum	Maximum	
Arsenic	50	WFD	1.2	14	0
Cadmium	25*	WFD	<0.08	0.27	0
Copper	1.0	WFD	<1.0	19	2
Lead	1.2	WFD	<1.0	5.8	2
Zinc	13.7	WFD	<1.0	16	2

Notes:
- WFD - Water Framework Directive
- BLDL - Below Laboratory Detection Limit

5.2 Soil Leachate Test Results (Continued)

Table 5.2 Summary of Groundwater Chemical Test Results: Polyaromatic Hydrocarbons

Substance	EQS (µg/l)	Source	Measured Concentrations of Tested Substances (µg/l)		Number of exceedances
			Minimum	Maximum	
Naphthalene	2	WFD	<0.01	<0.01	0
Acenaphthylene	-	-	<0.01	<0.01	0
Acenaphthene	-	-	<0.01	<0.01	0
Fluorene	-	-	<0.01	<0.01	0
Phenanthrene	-	-	<0.01	<0.01	0
Anthracene	0.1	WFD	<0.01	<0.01	0
Fluoranthene	0.0063	WFD	<0.01	<0.01	BLDL
Pyrene	-	-	<0.01	<0.01	0
Benzo(a)anthracene	-	-	<0.01	<0.01	0
Chrysene	-	-	<0.01	<0.01	0
Benzo(b)fluoranthene	0.017	WFD	<0.01	<0.01	BLDL
Benzo(k)fluoranthene	0.017	WFD	<0.01	<0.01	BLDL
Benzo(a)pyrene	0.00017	WFD	<0.01	<0.01	BLDL
Indeno(123cd)pyrene	-	-	<0.01	<0.01	0
Dibenzo(ah)anthracene	-	-	<0.01	<0.01	0
Benzo(ghi)perylene	0.0082	WFD	<0.01	<0.01	BLDL
Total PAH	-	-	<0.1	<0.1	-

Notes:
- WFD - Water Framework Directive
- - No guideline available
- BLDL - Below Laboratory Detection Limit

SECTION 6 Soakaway Testing

Six soakaway tests were undertaken across the site to the requirements of BRE Digest 365. In order maintain the stability of the trial pit sides, the pit was filled by 40mm stone, and surround a slotted HDPE pipe with filter sock. A water sensitive dipmeter was used to record the head of water within the trial pit.

Table 5.1 summarises the results obtained from the soakaway tests.

Table 6.1 Soakaway Test Results

Location	Depth (m)	Test	Infiltration Rate (m/s)
TP01-2020	1.65	Test 1 of 3	1.04×10^{-4}
		Test 2 of 3	9.16×10^{-5}
		Test 3 of 3	4.63×10^{-5}
TP02-2020	1.3	Test 1 of 3	7.09×10^{-5}
		Test 2 of 3	5.57×10^{-5}
		Test 3 of 3	5.38×10^{-5}
TP03-2020	1.9	Test 1 of 3	5.67×10^{-5}
		Test 2 of 3	4.87×10^{-5}
		Test 3 of 3	5.03×10^{-5}
TP04-2020	1.7	Test 1 of 3	5.05×10^{-5}
		Test 2 of 3	3.59×10^{-5}
		Test 3 of 3	4.04×10^{-5}
TP05-2020	1.8	Test 1 of 3	5.20×10^{-5}
		Test 2 of 3	6.16×10^{-5}
		Test 3 of 3	6.16×10^{-5}
TP06-2020	1.6	Test 1 of 3	1.24×10^{-4}
		Test 2 of 3	1.20×10^{-4}
		Test 3 of 3	1.29×10^{-4}

SECTION 7 Preliminary Ground Gas Risk Assessment

As previously discussed in **Section 4.5**, seven gas monitoring wells were monitored for ground gas.

Two rounds of gas monitoring have been undertaken far. A summary of the gas concentrations encountered is outlined below:

- Methane concentrations of between 0.0% and 0.1%,
- Carbon dioxide concentrations of between 0.3% and 1.6%,
- Oxygen concentrations of between 18.7% and 20.2%,
- No gas flow rates of greater than +0.0 l/hr or less than -0.0 l/hr have been detected,

As no gas flow rate from the boreholes has been detected, the limit of detection of the gas monitor (0.1 l/hr) has been used.

Based on a flow rate of 0.1 l/hr and the highest recorded methane concentration of 0.1%, a preliminary gas screening value is calculated, as follows:

(0.1/100) x 0.1 = 0.0001 l/hr

Based on a flow rate of 0.1 l/hr and the highest recorded carbon dioxide concentration of 1.6%, a preliminary gas screening value is calculated, as follows:

(1.6/100) x 0.1 = 0.0016 l/hr

When these results are compared with Table 8.5 of CIRIA report C665, the site is preliminarily classified as ‘gas characteristic situation 1’. Following the completion of the remaining gas monitoring, a final ground gas risk assessment will be determined.

The gas monitoring results are presented in **Annex F**.

SECTION 8 Groundwater Level Monitoring

Groundwater monitoring was undertaken between 9:00am on Monday 10th February 2020 and 9:00am on Monday 17th February 2020 using an In-situ Inc. Rugged Troll 100 groundwater data logger, and a Rugged BaroTroll barometric pressure data logger. The data loggers were installed within the shallow monitoring well of BH103 where the shallowest groundwater level had previously been recorded. The period of monitoring coincided with spring tide.

The groundwater monitoring was undertaken to determine whether groundwater beneath the site is influenced by the tide, and if so, to what extent.

During the period of groundwater monitoring, the deepest groundwater level was recorded at 3.853m below ground level at 03:45 on Friday 14th February. The shallowest was 3.725m below ground level at 09:00 on 17th February. It should be noted that groundwater level was continuing to rise whilst the data logger was retrieved from the monitoring well.

The groundwater monitoring data indicates that there is no apparent correlation between changes in the groundwater level and the tide, and as such it appears that the tide has little to no influence on the groundwater level. Indeed, when groundwater level measurements are compared to rainfall data over a similar period, peaks in groundwater levels were recorded shortly after peaks in rainfall during the evening of 12th/morning 13th February, and a prolonged period of heavy rainfall on the 15th and 16th February.

A copy of the groundwater level data and rainfall data is presented in **Annex G**.

SECTION 9 Slag Expansion Testing

Thomas Research Services (TRS) Limited undertook a petrological examination of three slag-containing soil samples taken from the site.

In summary, the report concluded that all three samples were similar consisting predominantly of materials from heating furnaces and metal smelting, either of iron or copper.

The dominant slag present was acid slag, which was fairly dense and unaltered. Significant silica refractory was present, often as macro inclusions within the slag.

Other materials present in the samples included quartz, alumino-silicate brick, limestone, iron metal, rust, fume, burnt shale, coke, coal and clay.

No normal blast furnace slag, basic steel slag or basic refractory material was seen in any of the samples. As such, no expansion testing is recommended on these samples.

SECTION 10 Quantitative Risk Assessment

10.1 Leachable Contaminants of Concern

A few contaminants were recorded slightly above their respective target concentrations. **Table 10.1** summarises these exceedances.

Table 10.1 Summary of Soil Leachate Chemical Exceedances

Substance	Threshold (µg/l)	Recorded Exceedance (µg/l)	Location
Copper	1.0	19 13	TP01-20 (0.1m) TP02-20 (0.1m)
Lead	1.2	5.1 5.8	TP03-20 (0.4m) TP03-20 (0.8m)
Zinc	13.7	16 16	TP01-20 (0.1m) TP02-20 (0.1m)

Based on the elevated levels of metals, metalloids and polycyclic hydrocarbons, it was considered that there was a potential risk to controlled waters if the contaminants were significantly leachable and soakaways are used as part of the proposed development.

However, based upon the relatively low leachate concentrations encountered by the testing, and the distance from the closest surface water body, it is considered that the risk to the aquatic environment is negligible. It should also be noted that soil leachate test results will provide far higher results than those encountered in the groundwater so can therefore be reasonably considered a 'worst-case scenario'.

10.2 Potential Receptors and Pathways

10.2.1 Aquatic Environment

The nearest surface water feature is the mean high tide of Swansea Bay, located 130m southwest of the site.

It is proposed that soakaway drainage will be used at the site. Based on the soil leachate test results, it is considered that the introduction of soakaways at the site will not significantly increase the effectiveness of the pathway between the source (made ground) and receptor as contaminant concentrations from the leachate testing are relatively low.

The contaminants recorded slightly above their relevant guidelines are consistent with those expected at a site covered and surrounded by slag and located in an area with a legacy of ferrous smelting. The metal concentrations recorded by the leachate testing are not considered to be significantly high when taking into consideration the results were recorded by leachate testing of the soil, and the site's location.

Based on the above it is considered that the site will not pose a significant risk to controlled waters in the surrounding area, even after the installation of soakaway drainage, and that no further assessment of the site in relation to the aquatic environment is warranted.

ANNEX A

Clarke Bond Phase 1 Geoenvironmental Assessment

ENGINEERING AND MANAGEMENT CONSULTANTS

clarkebond

Report No	Date
WB03278/R1	14 October 2013

Project

AFAN LIDO, PORT TALBOT
PHASE I GEOENVIRONMENTAL ASSESSMENT

Client

NEATH & PORT TALBOT COUNCIL



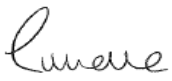
CLARKEBOND (UK) LTD
129 Cumberland Road,
Bristol
BS1 6UY

© Clarkebond (UK) Limited

Report No:	Date:
WB03278/R1	14 October 2013

Project:
AFAN LIDO, PORT TALBOT **PHASE I GEOENVIRONMENTAL ASSESSMENT**

Issue Number	Status	Description of Amendments
0	**Final**	

Report prepared by:	
Signed 	Chris Whale BSc, FGS **Principal Geoenvironmental Engineer**
Approved for issue by:	
Signed 	André Gilleard BEng (Hons) CEnv CSci SiLC **Associate Director - Geoenvironmental**

This report is provided for the benefit only of the party to whom it is addressed and we do not accept responsibility to any third party for the whole or any part of the contents and we exercise no duty of care in relation to this report to any third party.

© Clarkebond (UK) Limited

CONTENTS

EXECUTIVE SUMMARY i

1.0 INTRODUCTION 1
1.1 Instruction 1
1.2 Scope of Works 1
1.3 Report Layout 1
1.4 Limitations 1

2.0 PHASE I ASSESSMENT 2
2.1 Site Location 2
2.2 Site Description 2
2.3 Geology 2
2.4 Hydrology and Hydrogeology 3
2.5 Site History 3
2.6 Coal Mining Report 4
2.7 Environmental Database 4

3.0 PRELIMINARY CONCEPTUAL MODEL 6

4.0 GEOTECHNICAL AND ENVIRONMENTAL CONSIDERATIONS 8
4.1 Proposed Development 8
4.2 Anticipated Ground Conditions 8
4.3 Geotechnical Considerations 8
4.4 Environmental Considerations 9
4.5 Recommendations for Further Investigation 10

FIGURES
2.1 - Site Location Plan

APPENDICES
A – Photofile
B – Historic Maps
C – Coal Mining Report
D – GroundSure Reports

EXECUTIVE SUMMARY

Client	Neath & Port Talbot County Borough Council
Site	Afan Lido, Port Talbot, South Wales
Site Location	Approximate Grid Reference E274678, N189504.
Proposed Development	No development plan exists at present, but likely to be commercial and leisure.
Site History	Historically sand dunes up to development of Lido in 1960's (recently demolished and site cleared). Site currently contains a small sub-station (c.1961), car park areas, some fly tipping and a bund of unknown content. A further sub-station (c.1952) lies just north of the site and several unknown tanks once lay just north east of the site.
Geology	Made Ground - Unknown type and depth estimated as GL-1m. Superficial - Wind Blown Sands/Tidal Flat Deposits/Diamicton, to 25-30m estimated depth. Solid – Coal Measures.
Environmental Considerations	The site lies over a Secondary 'A' aquifer and is adjacent to the Bristol Channel. There are no water abstractions noted close to the site. The site is almost certainly subject to saline intrusion. ***Existing Made Ground*** – The site could potentially be underlain by Made Ground. There is also an existing bund. The chemical composition of these is not known. ***Invasive Species*** –Japanese Knotweed or other invasive species have not been observed on site. A detailed site survey should be completed during the spring to confirm the absence of Knotweed. ***Car Parking*** –There is the potential of hydrocarbon impact from fuel oils/lubricant leakage from the existing car parking areas. ***Asbestos*** – Asbestos could potentially be present within the electricity substation in the eastern corner. An asbestos survey should be carried out, and the shallow soils analysed for its presence (from demolition of former buildings). ***Contemporary Trade Entries*** – Electricity sub-stations (both on- and off- site) could be sources of contamination. ***Above Ground Storage Tanks*** – Tanks were noted on the adjacent site to the north. The potential for contamination from these tanks to be present in the shallow depth soils should be considered in any site investigation and risk assessment. ***Ground Gases*** - Precautions due to the presence of ground gases may be a consideration at this site, due to the probable presence of Made Ground. Installation of gas monitoring standpipes and an appropriate gas-monitoring regime should be completed as part of future site investigations. ***Radon Gas*** – Radon protection measures are not required.

Geotechnical Considerations	***Foundations*** - Made Ground and loose windblown sand are unlikely to provide an adequate bearing stratum for conventional shallow foundations. Ground improvement or piled foundations are likely to be required. The risk to the site from coal mining is considered as negligible. An intrusive site investigation should be completed to confirm the soil profile across the site. ***Floor Slabs*** - Ground bearing floor slabs may be appropriate depending on the nature of the shallow soils. ***Buried Concrete*** - Special measures for the protection of buried concrete may be required. Testing to establish soil chemistry is required to assess this risk. ***Site Drainage –*** Whilst the Wind Blown Sand should be suitable for soakaway drainage, the potential presence of groundwater at ~2m-3m depth and it's tidal nature may negate this. **Excavation stability** - Excavation stability could be an issue in the loose beach deposits. If deep excavations are required significant groundwater control measures could be required. **Flood Risk** - The promenade is a boundary to a Zone 3 flood plain. A flood risk assessment may be required by the local planning authority
Risk Rating	The general geotechnical risk is considered to be low/medium. Caution in this respect arises principally from the possible presence of running sand in the drift deposits, their loose density and potential for shallow (~2-3m) groundwater. The general risk of significant chemical contamination is considered low.
Site Investigation Recommendations	• Trial Pitting including in-situ strength testing, soakaway potential and in-situ CBR testing. • Cable percussion boreholes with SPT testing. • Groundwater and gas monitoring standpipe installations. • Gas and groundwater monitoring over a tidal cycle. • Geotechnical laboratory testing that is recommended includes pH and water soluble sulphate, Atterberg limits, gradings and natural moisture content. • Contaminated land testing that is recommended includes a general indicator suite, speciated Total Petroleum and Polyaromatic Hydrocarbons, asbestos screening and PCB's.

1.0 INTRODUCTION

1.1 Instruction

Clarkebond (UK) Ltd was commissioned by Neath & Port Talbot County Borough Council to undertake a Phase I Geoenvironmental Assessment on a site known as Afan Lido, Port Talbot, Gwent.

1.2 Scope of Works

The objectives of the investigation were to determine the sub-surface conditions in respect of:

- Preliminary geotechnical advice relating to the anticipated ground conditions
- Preliminary contamination assessment to consider potential significant pollutant linkages arising from the historic usage of the site and surroundings.

1.3 Report Layout

Section 2.0 - provides a record of the Phase I assessment including the site history.
Section 3.0 - presents a preliminary Conceptual Model for the site.
Section 4.0 - details the anticipated geotechnical and environmental conditions.

1.4 Limitations

This report is provided for the benefit only of the party to whom it is addressed and we do not accept responsibility to any third party for the whole or any part of the contents and we exercise no duty of care in relation to this report to any third party.

This assessment has been based to a large extent on third party data. This data has been taken at face value and has not been subjected to any validation.

Where intrusive investigations have been completed, information, comments and opinions given in this report are based on the ground conditions encountered during the site work and on the results of laboratory and field tests performed during the investigation. However, subsoils are inherently variable and hidden from view such that no investigation can be exhaustive to the extent that all soil conditions are revealed. Conditions may therefore be present beneath the site that were not apparent in the data reviewed as part of this assessment. In particular, it should be noted that groundwater levels vary due to seasonal and other effects and may at times differ to those measured during the investigation.

2.0 PHASE I ASSESSMENT

2.1 Site Location

The site is located approximately 1km to the south west of Port Talbot town centre. It has an approximate National Grid Reference of E274678, N189504. A site location plan is presented as Figure 2.1.

2.2 Site Description

The site was visited on 6th September 2013 and the following site description completed. The weather at the time was sunny. Typical photos of the site are included in Appendix A.

The site is located close to the coast. It can be subdivided into two areas, the northwest which was the former Lido site and the southeast which is mainly open ground and a former car park. The sites are separated by Channel View and is bound by The Princess Margaret Way to the south west.

The northwest site measures approximately 125m by northeast to southwest and 135m southeast to northwest, equating to an area of approximately 1.6hectares. It is currently completely surrounded by wooden hoarding. All the buildings within the site have been demolished and cleared with no spoil heaps remaining. Along the southwest boundary with The Princess Margaret Way are some soft landscaping area and, the majority of the rest of the site is either tarmac hardstanding or levelled hardcore. A gas governor structure lies in the north east of this area and there is also minor fly-tipping in that area.

The northeast end of this part of the site drops down by approximately 1m in elevation. In the northern corner the site steps down and in the eastern corner there is a sloping area of grass.

The southwest site measures approximately 42m northeast to southwest and 240m southeast to northwest, equating to an area of about 1 hectare. At the northwest end there is a tarmac car park, which currently services a small portakabin building used as a gym. The rest of the site is open ground with some low vegetation growth, interspersed with small areas of tarmac. There is another significant area of tarmac at the south eastern end. There is a small electricity substation in the eastern corner.

There is a small low bund of material stacked against the boundary wall to the eastern end.

The northern site is bound to the north west by a football ground and an indoor bowls site together with some housing, a restaurant and a small electric sub-station. To the south west is a promenade play area beyond which is a beach. To the north east of the southern site is a school grounds and off the southern corner is housing, on the opposite side of The Princess Margaret Way.

The walk over did not reveal any evidence of Japanese Knotweed or other invasive species and no evidence of contamination in the form of spills or staining was noted.

2.3 Geology

The geology of the site is shown in the Groundsure report which are extracted from the British Geological Survey Digital Geological Map of Great Britain at 1:50,000 scale.

The site is directly underlain by superficial blown sand deposits. This is underlain by the South Wales Middle Coal Measures Formation comprising mudstones, siltstones and sandstones of Carboniferous age.

There are several borehole records available close to the site, mainly completed by water works or for cola exploration. The deep boreholes suggest at least 30m of drift deposits above the bedrock. Boreholes completed for the promenade proved 12-13m of sands. No strengths are indicated, although in the deep boreholes running sands are referred to and in the promenade boreholes peat is also referred to.

2.4 Hydrology and Hydrogeology

The nearest surface water features to the site are the Bristol Channel and also the Afon Afan which enters the sea some 500m to the south. Due to the proximity, the potential risk to t former receptor from potential contamination on site could be deemed to be medium.

Guidance from the Environment Agency indicates that the both the superficial and bedrock deposits are classified as Secondary 'A' aquifers. The definition is *permeable layers capable of supporting water supplies on a local rather than strategic scale.*

There are no water abstractions noted close to the site and since the site is almost certainly subject to saline intrusion, then the site sensitivity in terms of the it being a potential contaminating source to the aquifers is regarded as low.

2.5 Site History

Historical maps of the site area have been obtained via Groundsure and copies are included as Appendix B. Pertinent information determined from review of these maps is set out in the following table:

Table 2.1 - Historic Mapping Review

Date	On-site	Off-site
1881	The site comprises dunes and mudflats	Dunes and mudflats
1899	No significant change	There is some development of a track and railway to the southeast which leads to the north pier. A band stand is indicated to the south.
1917-1921	No significant change	A hotel and skating rink has been built close to the southern corner of the site. There is a brick works indicated remote to the north
1939	No significant change	Some additional development to the southeast of the site
1952-1955	No changes apart from in the northern area the site encroaches into a site that contains several tanks (no tanks shown on our site).	There has been significant development of residential housing and a school to the northeast, and southeast. There is an industrial unmarked site adjacent to the north east which contains 6no. tanks. There is an electricity sub-station immediately north.
1961-1966	The lido and indoor sports centre is shown (with slopes down to the latter) and the southern site is indicated as a car park. Channel View now cuts the site in two. A small electric sub-station now lies in the south eastern corner of the site.	The tanks are not now shown to the north east. The promenade is being developed to the southwest. The Princess Margaret Way has been built.
1971	No significant change	No significant change
2012	No significant change	No significant change apart from retail development to the northwest.

In summary the site has remained undeveloped until the Lido and sports centre were built sometime before 1961. The site is within an area used for sand works and brick works and this should be considered. The 1955 maps show an unmarked site to the north which contained tanks and onto which our current site slightly encroached (no tanks were shown within our site). This tank site has been redeveloped as a football ground and whilst it is possible that any contamination issues regarding these tanks may have been dealt with at that time, the

presence of potential contamination from the tanks shoud be considered in any future risk assessment and investigations.

In the surroundings an electric sub-station appeared sometime before 1952 and remains to date.

2.6 Coal Mining Report

A coal mining search was commissioned from The Coal Authority, a copy of which is included in Appendix C.

The report confirms that the site is not within the likely zone of influence of past or present mining and thus the risk to the site is considered as negligible.

2.7 Environmental Database

A Groundsure report was commissioned to provide an indication of the site history and surrounding land uses available on the public registers. The report provides data from a number of service providers including the British Geological Survey, Environment Agency and English Nature. The report is included in Appendix D.

The location of data point references is provided relative to the National Grid Reference for the site centre. The search radius extends 1km from the site boundary.

Table 2.2 below indicates the risk scoring used on the potential pollutant linkages identified from the historic data search. The degree of risk (R) is calculated by multiplying the likelihood (L) with the effect (E):

Table 2.2 - Degree of risk (R) = Likelihood (L) x Effect (E)

Likelihood (L)	Description	Probability	Effect (E)	Description	Increase In Cost And Time
5	Almost certain	>70%			
4	Probable	50-70%	4	Very high	>10%
3	Likely	30-50%	3	High	4-10%
2	Unlikely	10-30%	2	Low	1-4%
1	Negligible	<10%	1	Very low	<1%
Risk (R)	**Risk Level**	**Action**			
1-5	Trivial	None			
6-10	Significant	Undertake appropriate mitigation measures to reduce the risk level by appropriate on-site practice at little additional cost.			
>10	Substantial	Designers should take such risks into account and avoid or reduce risk level to acceptable levels. Additional resources required.			

The following table (overleaf) provides a summary of the data reference points, together with an indication of the hazard, likelihood, severity and degree of risk.

In summary the environmental report highlights the main risk to the site are the electricity sub stations which can be a source of asbestos, hydrocarbons and Polychlorinated Biphenyls (PCB's) and the presence of these contaminants should be investigated. A pollution incident from 2009 is noted, although this was smoke and there is unlikely to be any residual risk.

Although the site is not within a designated flood risk zone, the promenade marks the extent of a Zone 3 flood plain. A flood risk assessment may be required by the local planning authority.

No radon protective measures are required.

Table 2.3 - Environmental Data Review

Data Type	Distance from site	Hazard	Likelihood	Effect	Degree of risk	Mitigation measures
Substantiated Pollution Incident Register	On site	Contamination from pollution incidents – 2009,Pollutant=smoke	5	1	5	None required
Extreme flooding from rivers or sea without defences.	On site	Risk from Flooding – Site within 100m of Zone 3 Flood Plain	2	3	6	Undertake Flood Risk Assessment
Registered Landfill sites, Waste Transfer Stations		None within 500m	--	--	--	None required
Shallow Mining Hazard	On site	Risk from past & current coal mining	2	3	6	None Required
Potential for running sand ground stability hazards	On site	Ground instability induced by running sand in excavations	3	2	6	Site Investigation
Radon Affected Areas	On site	1-3% Above action levels	2	2	4	No Radon Protective Measures required.
Contemporary Trade Directory Entries	On site and 29m	Electricity sub stations in the southeast corner and 29m to the north	2	3	6	Site Investigation
Environmentally Sensitive Areas		None	--	--	--	None required

3.0 PRELIMINARY CONCEPTUAL MODEL

The site characterisation attempts to identify potential previous and existing site sources of contamination. The conceptual model links the identified sources likely to cause significant possibility of significant harm via pathways to identified critical receptors. The conceptual model is therefore based on a number of identified source-pathway-receptor scenarios. For land to be classified as contaminated a significant pollutant linkage will need to be identified which will include each component of the conceptual model. The absence or removal of a source or interception of a pathway will 'break' the pollutant linkage.

The conceptual model is characterised by identification of the following:

- **On-site** sources, which may impact **on-site** receptors via plausible pathways.
- **On-site** source, which may impact **off-site** receptors via plausible pathways.
- **Off-site** sources, which may impact **on-site** receptors via plausible pathways.

In the event of a change of land use assessment will be required of the new site development layout within the context of introducing new exposure pathways. The planning regime will require assessment of the site to ensure any new development will not be classed as contaminated land.

A preliminary conceptual model is indicated in Tables 3.1, 3.2 and 3.3. This indicates the site and environs are considered as posing trivial/significant risk with respect to contamination. Indicators above trivial risk include:

- Composition of made ground on, or adjacent to, the site and potential contamination related to the former tanks (off-site) to the north east, the electricity sub-station in the south eastern corner and the further sub-station just off-site to the north. There is a small bund of material of unknown content against the wall along the boundary wall with the school which should be considered in any risk assessment and site investigation

Table 3.1 - On-Site to On-Site Source - Pathway - Receptor Model

Source 1	Source 2	Migration Pathway	L	Exposure Pathway	E	Receptor	R
Made Ground soils and former site uses	Heavy metals and/or hydrocarbons PCB's from sub stations	Migration of liquids & vapours through unsaturated zone; Migration through saturated zone/groundwater; Preferential flow paths (e.g. drains, service runs etc.)	2	Migration to groundwater	3	Groundwater and/or surface waters, and/or eco-system	6
Made Ground soils and former site uses	Heavy metals and/or hydrocarbons Asbestos and PCB's from sub stations	Ingestion of soil & household dust; Dermal contact with soil and household dust; Inhalation of indoor vapours and household dust; Inhalation of outdoor vapours and fugitive dust.	3	Migration to site users	3	Human beings	9

Table 3.2 - On-Site to Off-Site Source - Pathway - Receptor Model

Source 1	Source 2	Migration Pathway	L	Exposure Pathway	E	Receptor	R
Made Ground soils and former site uses	Heavy metals and/or hydrocarbons PCB's from sub stations	Migration of liquids & vapours through unsaturated zone; Migration through saturated zone/groundwater; Preferential flow paths (e.g. drains, service runs etc.)	2	Migration to groundwater	3	Groundwater and/or surface waters, and/or eco-system	6
Made Ground soils and former site uses	Heavy metals and/or hydrocarbons Asbestos and PCB's from sub stations	Ingestion of soil & household dust; Dermal contact with soil and household dust; Inhalation of indoor vapours and household dust; Inhalation of outdoor vapours and fugitive dust.	2	Migration to adjacent land users	3	Human beings	6

Table 3.3 - Off-Site to On-Site Source - Pathway - Receptor Model

Source 1	Source 2	Migration Pathway	L	Exposure Pathway	E	Receptor	R
Made Ground soils and adjacent site uses	Heavy metals and/or hydrocarbons, PCBs	Migration of liquids & vapours through unsaturated zone; Migration through saturated zone/groundwater; Preferential flow paths (e.g. drains, service runs etc.)	2	Migration to groundwater	3	Groundwater and/or surface waters, and/or eco-system	6

4.0 GEOTECHNICAL AND ENVIRONMENTAL CONSIDERATIONS

4.1 Proposed Development

There are no firm development proposals for the site at present, although it is likely to be developed for leisure or commercial usage.

4.2 Anticipated Ground Conditions

The anticipated ground conditions for majority of the site are summarised in the table below and are based on the available geological information and previous site investigation data from nearby sites.

Depth (m)	Brief Description
0.00 to 1.0/2.0	POTENTIAL MADE GROUND
1.0/2.0 to 7.0/8.0	Fine SAND locally with pebbles and peat (BEACH DEPOSITS)
7.0/8.0 to 25-30	Interbedded Blue sandy Clay with sand horizons (DIAMICTON)
Below 25-30	Coal Measures Bedrock

The nearest boreholes with geotechnical testing suggest that the windblown sands are typically loose, with the sands and gravels below that being medium dense to dense. Some of the boreholes in the vicinity in the same anticipated geology describe running sands at depth.

Groundwater is likely to be encountered at 2-3m below existing ground levels and is likely to be saline and have a tidal influence.

4.3 Geotechnical Considerations

The following geotechnical aspects should be considered:

- Made Ground may be present beneath the site, however this may be limited in thickness as the site was only undeveloped prior to the Lido. Brick works and sand extraction has been noted locally and there is thus the potential for backfilled pits to be present within the site confines.

- Based on boreholes in similar geology within the Afan area, the beach deposits are generally described as loose and for any development with moderate loads, are unlikely to be suitable as a bearing stratum. An intrusive site investigation should be completed to confirm the soil profile across the site.

- If significant organic or soft clays are not present then ground improvement maybe suitable within the sands and gravels. Following treatment design bearing capacities of 125-150kN/m^2 may be achievable. Moderate to high structural loadings may require a piled foundation solution.

- Ground bearing floor slabs may be appropriate depending on the nature of the shallow soils.

- Excavation stability could be an issue in the loose beach deposits. If deep excavations are required significant groundwater control measures could be required.

- Soakaway drainage may be possible in the beach sand deposits. If considered, then soakaway testing should be completed in line with BRE Digest 365: *Soakaway Design*, 2007. Consideration will have to be made to the groundwater level and it's tidal fluctuation.

- The promenade is a boundary to a Zone 3 flood plain. A flood risk assessment may be required by the local planning authority

- Special measures for the protection of buried concrete may be required. Chemical analysis of the Drift Deposits should be completed and the grade of concrete assessed in line with BRE Special Digest 1, *Concrete in Aggressive Ground*, 2005, 3rd Edition.

4.4 Environmental Considerations

The desk study completed to date highlights the following sources of contamination on site:

Existing Made Ground – The site could potentially be underlain by Made Ground, the chemical composition of which is not known.

Invasive Species –Japanese Knotweed has not been observed on site. A detailed site survey should be completed during the spring to confirm its absence. It is commonly spread by fly tipping, soil movements about and to off-site, and via inappropriate treatments. Where poorly treated prior to construction, stands have regrown post construction causing significant structural damage, failure in some instances and loss of use.

Car Parking –There is the potential of hydrocarbon impact from fuel oils/lubricant leakage from the existing car parking areas.

Asbestos – Asbestos could potentially be present within the electricity sub station in the eastern corner. An asbestos survey should be carried out, and the shallow soils analysed for its presence (it could also have been present in the former buildings on site and following demolition may now be present in the ground).

Above Ground Storage Tanks – Tanks were noted on the adjacent site to the north east. Whilst contamination issues may have been dealt with in the development of that site and the lido site, the potential for contamination from these tanks to be present in the shallow depth soils should be considered in any site investigation and risk assessment. Sampling and contamination testing along the north eastern boundary should be competed to confirm or deny this.

Contemporary Trade Entries – The environmental database search found electricity sub stations that could be sources of contamination (both on- and off- site). If the underlying geological conditions were right, there could be the potential of contaminant migration beneath the site.

Ground Gases - Precautions due to the presence of ground gases (Carbon Dioxide, Methane and Hydrogen Sulphide) may be a consideration at this site, due to the probable presence of Made Ground. Installation of gas monitoring standpipes and an appropriate gas-monitoring regime should be completed as part of future site investigations.

Radon Gas – The environmental database showed that 1-3% of homes in the site vicinity were above the action level. Therefore, radon protection measures are not required.

Summary
The general risk of significant contamination at this site is considered to be low. The potential impact to the groundwater and local environment should be assessed by appropriate analysis of the soils and groundwater together with a risk assessment based on the site-specific criteria.

4.5 Recommendations for Further Investigation

Based on the desk study completed to date, the following broad scope of investigation is recommended in order to assess the environmental and geotechnical risks at this site:

- Trial Pitting including in-situ strength testing, soakaway potential and in-situ CBR testing.
- Cable percussion boreholes with SPT testing.
- Groundwater and gas monitoring standpipe installations.
- Gas and groundwater monitoring over a tidal cycle.
- Geotechnical laboratory testing that is recommended includes pH and water soluble sulphate, Atterberg limits, gradings and natural moisture content.
- Contaminated land testing that is recommended includes a general indicator suite, speciated Total Petroleum and Polyaromatic Hydrocarbons, asbestos screening and PCB's.

FIGURES

2.1 - Site Location Plan

APPENDICES

Appendix A – Photofile **(18 A4 sheets)**
Appendix B – Historic Maps **(30 A3 Sheets)**
Appendix C – Coal Mining Report **(4 A4 Sheets)**
Appendix D – GroundSure Reports **(73 A4 Sheets)**

Appendix A – Photofile (18 A4 sheets)



Plate 1 – View northwest across lido site



Plate 2 – Northeast boundary with football club



Plate 3 – Fenced Southeast boundary of main site



Plate 4 – Tarmac area of Lido site



Plate 5 – View towards southwest boundary



Plate 6 – Small amounts of fly tipping along northeast boundary



Plate 7 – View from eastern corner of Lido site



Plate 8 – Gas governor in eastern corner of lido site



Plate 9 – View between sites looking southwest



Plate 10 – View across Lido site looking west



Plate 11 – View across lido site looking northwest



Plate 12 – View across lido site looking north



Plate 13 – Southern site car park



Plate 14 – Gym Building on southern site



Plate 15 – View looking southeast



Plate 16 – General view looking south



Plate 17 – General surfacing of southern site



Plate 18 – View looking northwest



Plate 19 – Southwest end of site



Plate 20 – Boundary wall with school, note bund material



Plate 21 – Sub station



Plate 22 – Sub station



Plate 23 – View looking northwest



Plate 24 – Access to southern site



Plate 25 – View along Princess Margaret Way



Plate 26 – Drainage along southwest



Plate 27 – View along southwest boundary



Plate 28 – Services leading into site



Plate 29 – Northern boundary of lido site



Plate 30 – northern boundary of lido site



Plate 31 – Indoor bowls centre off northern corner



Plate 32 – Northern boundary



Plate 33 – Substation 30m to the north

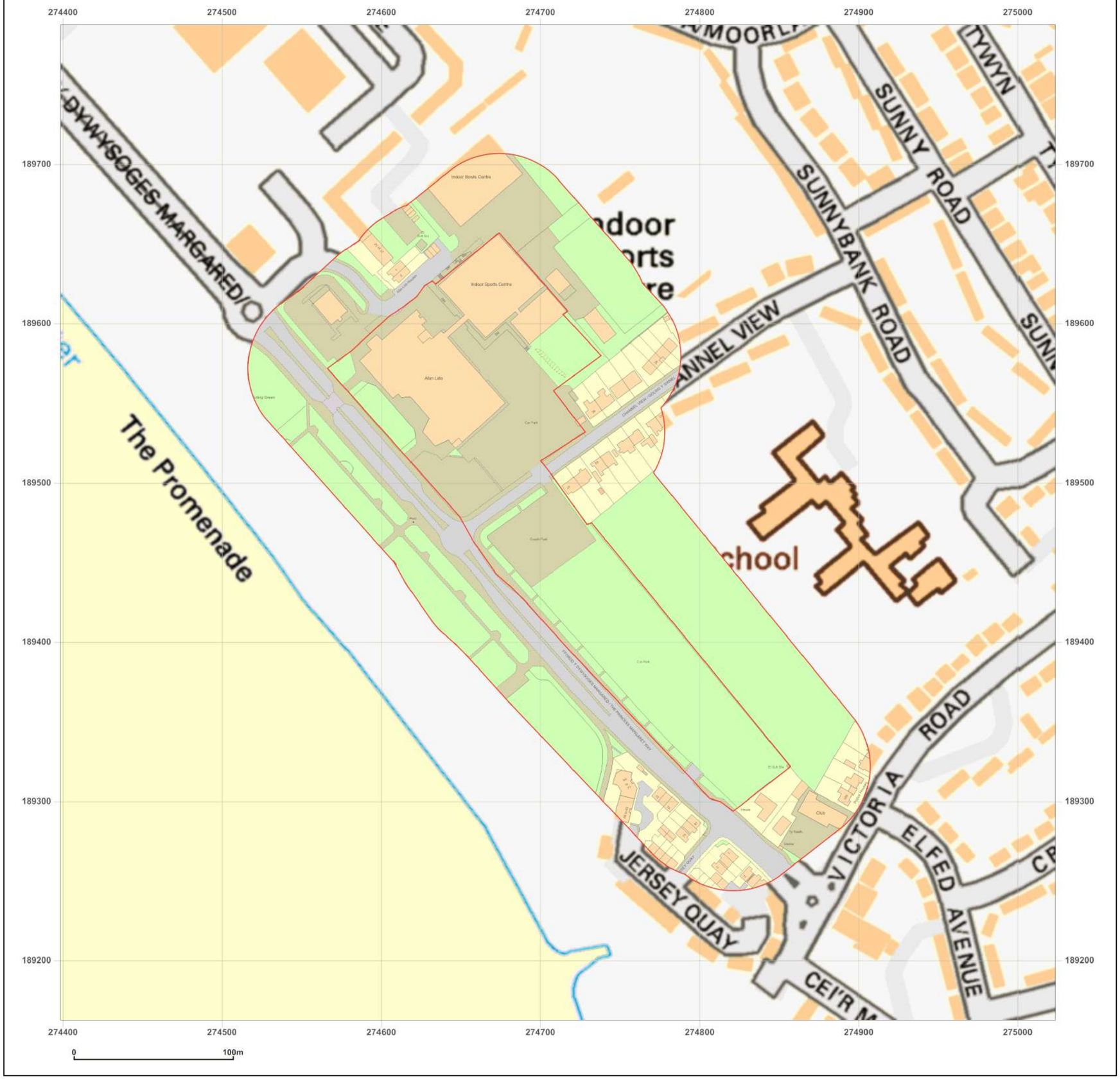


Plate 34 – Housing and bowls centre to the north



Plate 35 – Northern boundary view

Appendix B – Historic Maps (30 A3 Sheets)



Ordnance Survey® Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: MasterMap

Map date: **2012**

Scale: 1:1,250

Printed at: 1:2,500

N W E S

2012

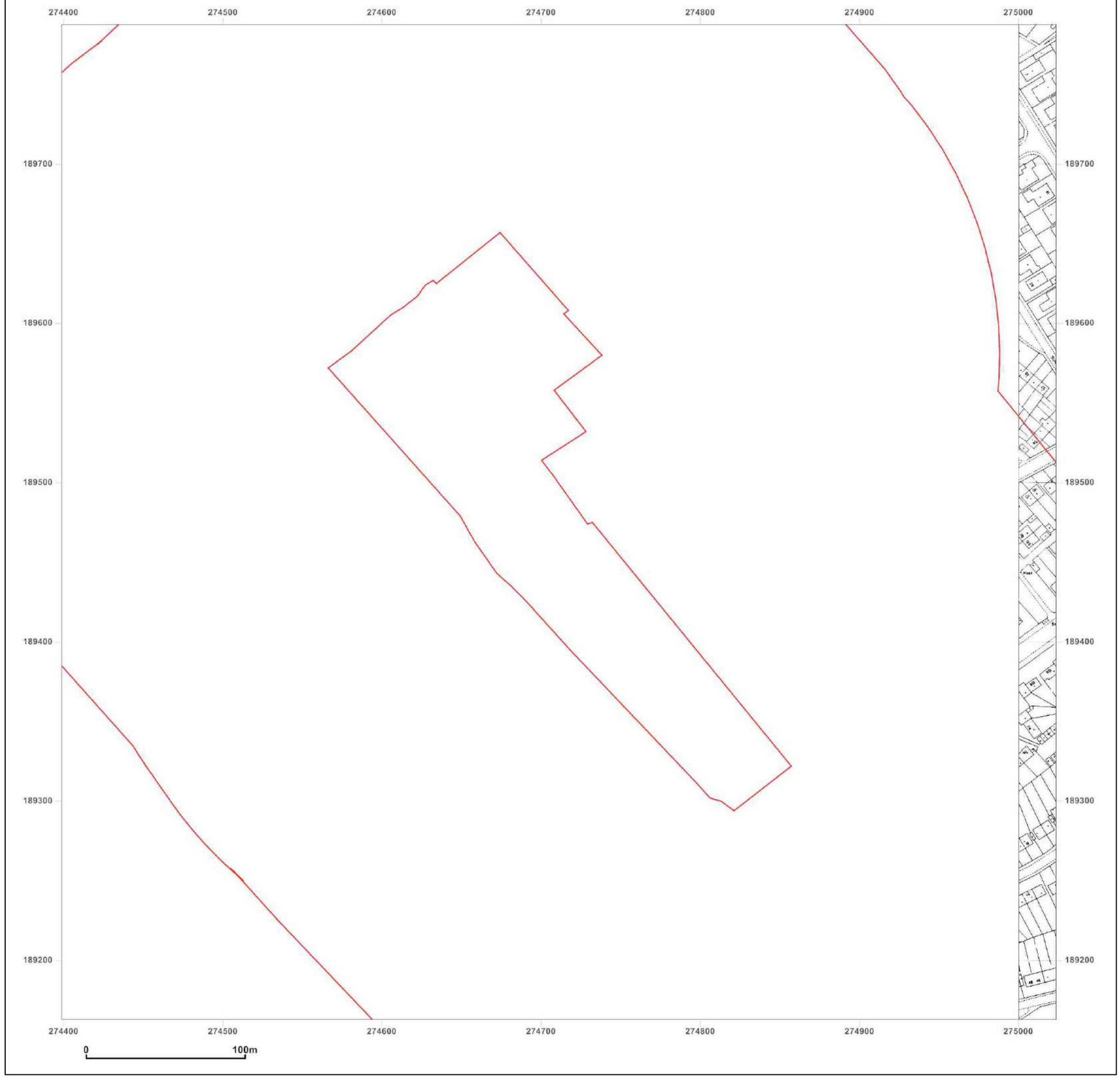
Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

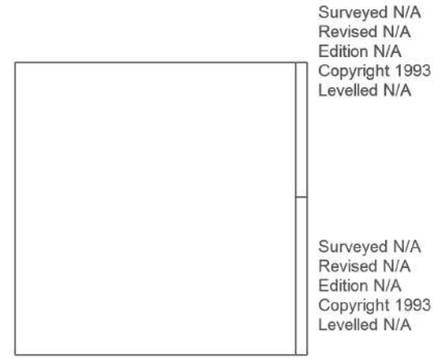
Map Name: National Grid

Map date: **1993**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S



GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

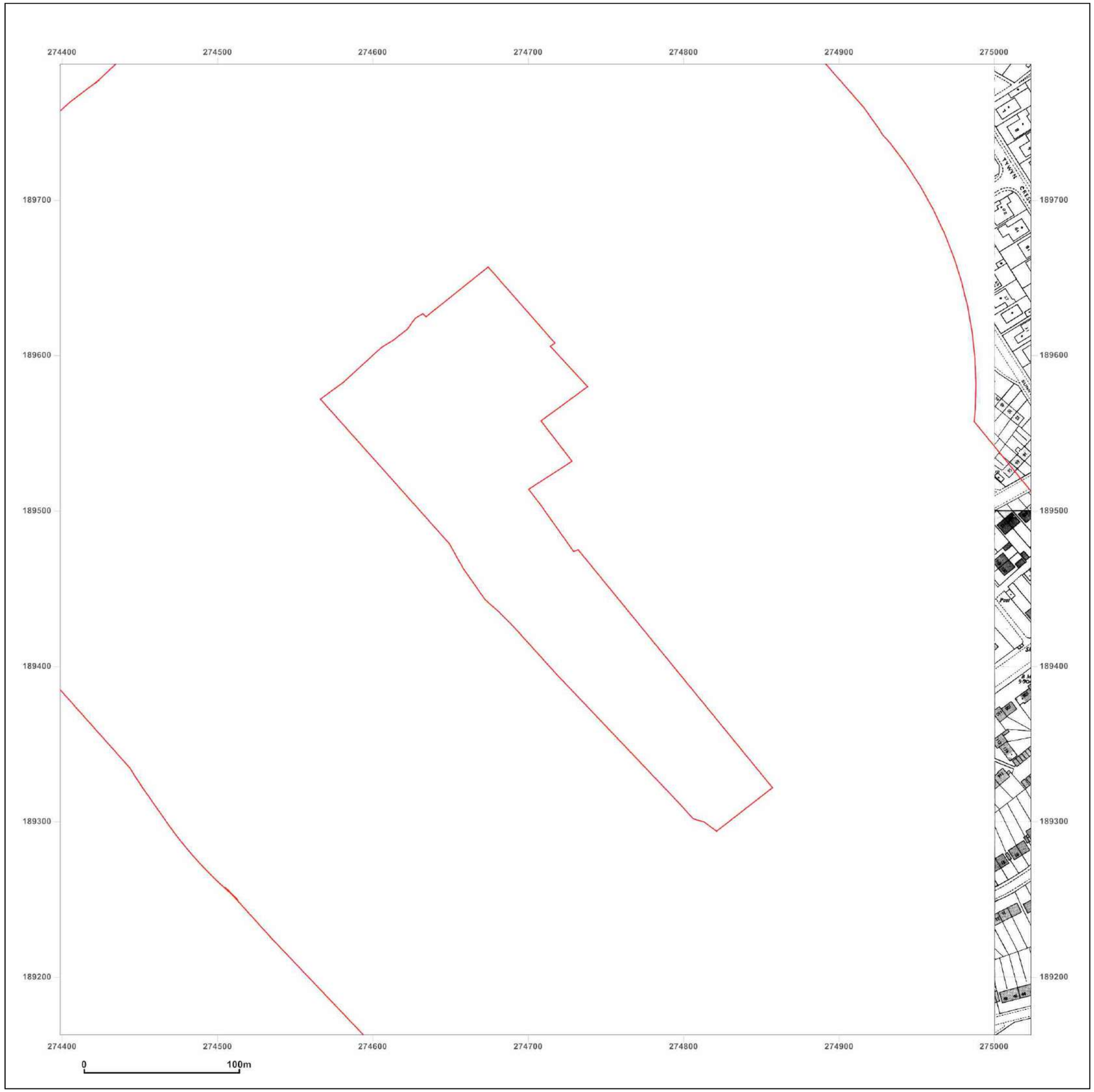
Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

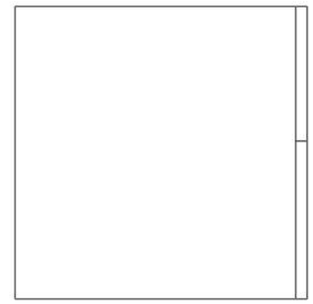
Map Name: National Grid

Map date: **1991**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S



Surveyed 1963
Revised 1991
Edition N/A
Copyright 1991
Levelled 1963

Surveyed 1991
Revised 1991
Edition N/A
Copyright 1991
Levelled N/A

GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

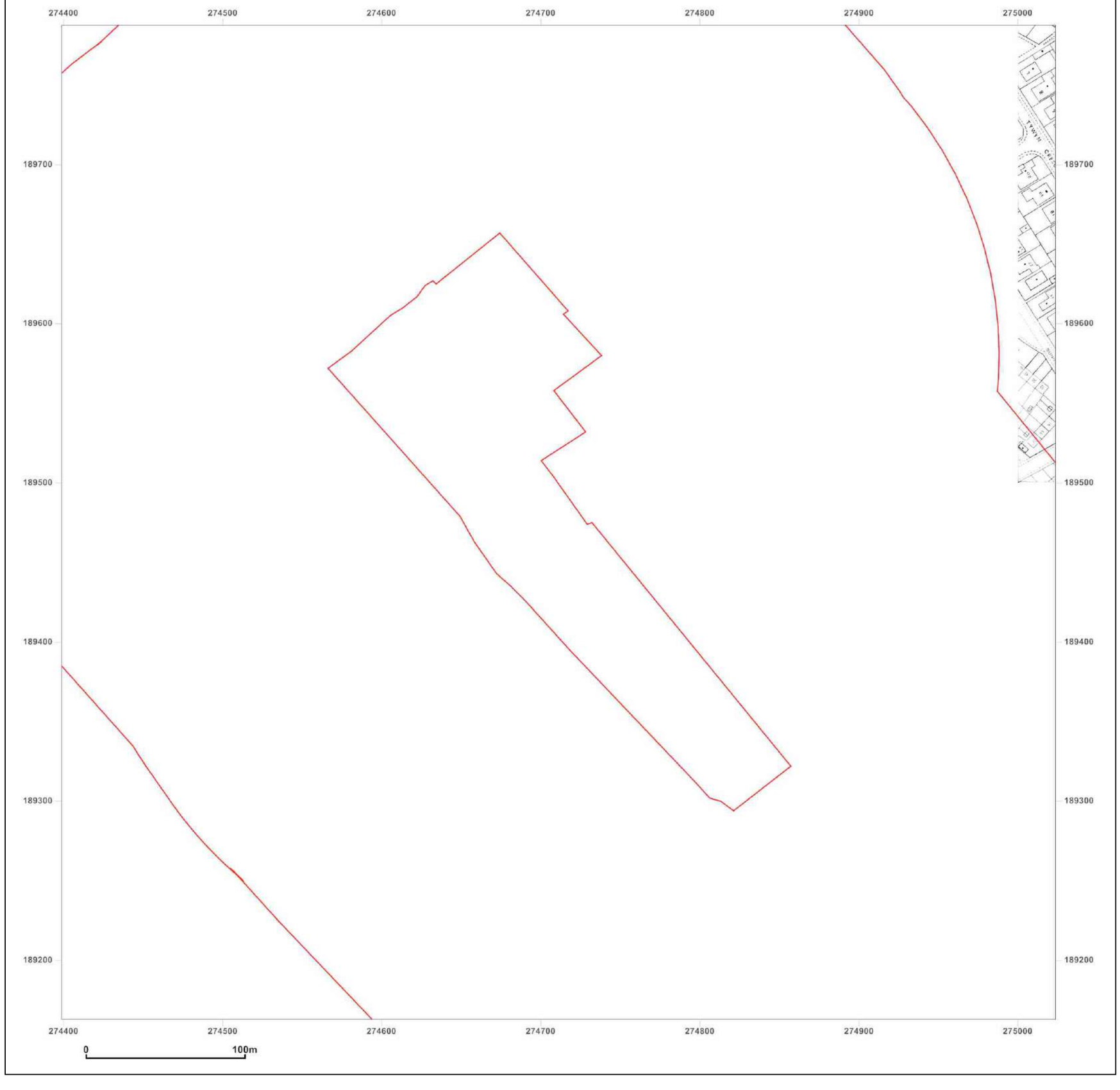
Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

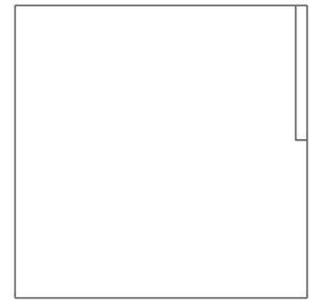
Map date: **1986**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1986
Levelled 1963



GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1966-1971**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1955 Revised 1966 Edition N/A Copyright 1966 Levelled 1963	Surveyed 1955 Revised 1970 Edition N/A Copyright 1971 Levelled 1963	Surveyed 1951 Revised 1967 Edition N/A Copyright 1968 Levelled 1963
	Surveyed 1955 Revised 1966 Edition N/A Copyright 1966 Levelled 1963	Surveyed 1951 Revised 1967 Edition N/A Copyright 1968 Levelled 1964

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey® Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1967**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1967
Revised 1967
Edition N/A
Copyright 1969
Levelled 1964

GroundSure

Ordnance Survey® Licensed Partner

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1961-1966**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1955
Revised 1960
Edition N/A
Copyright 1961
Levelled 1957

Surveyed 1955
Revised 1966
Edition N/A
Copyright 1966
Levelled 1963

Surveyed 1955
Revised 1960
Edition N/A
Copyright 1961
Levelled 1957

Surveyed 1951
Revised 1962
Edition N/A
Copyright 1962
Levelled 1957

GroundSure

Ordnance Survey® Licensed Partner

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

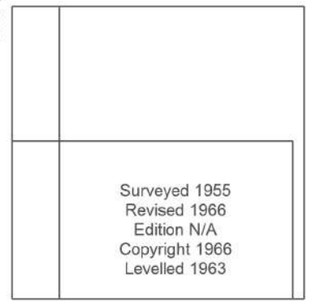
Map date: **1966**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1955
Revised 1966
Edition N/A
Copyright 1966
Levelled 1963



GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

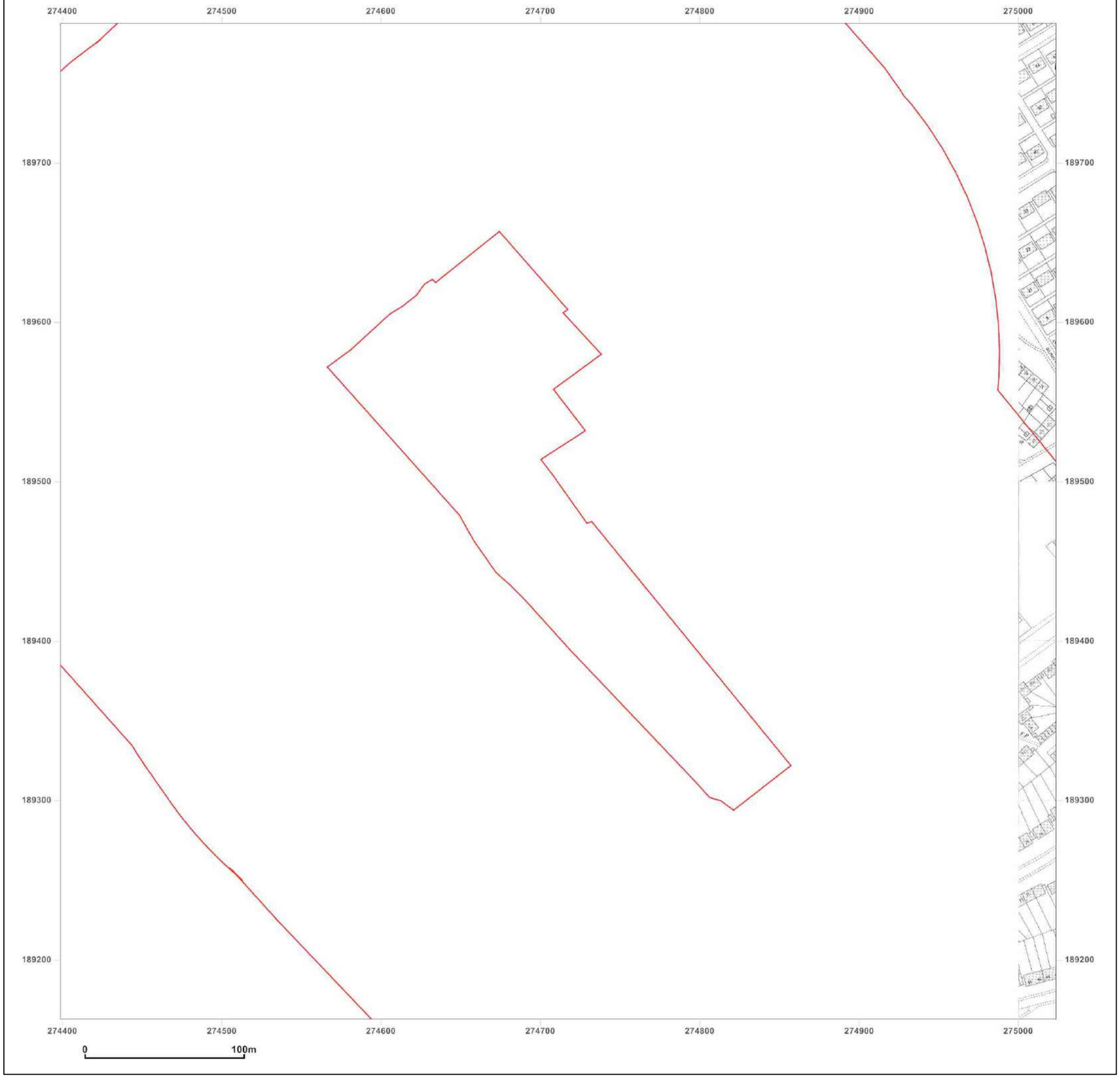
Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

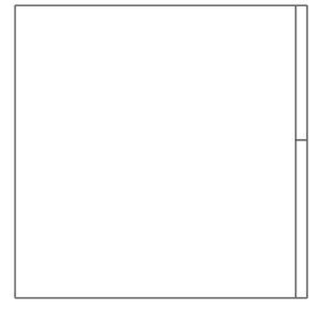
Map Name: National Grid

Map date: **1955-1960**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S



Produced by
GroundSure Environmental Insight
www.groundsure.com

Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey® Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1951-1955**

Scale: 1:1,250

Printed at: 1:2,500

N
W E
S

Surveyed 1955 Revised 1955 Edition N/A Copyright N/A Levelled 1949	Surveyed 1955 Revised 1955 Edition N/A Copyright N/A Levelled 1949	Surveyed 1951 Revised 1951 Edition N/A Copyright N/A Levelled 1949
	Surveyed 1955 Revised 1955 Edition N/A Copyright N/A Levelled 1949	Surveyed 1951 Revised 1951 Edition N/A Copyright N/A Levelled 1949

GroundSure

Ordnance Survey® Licensed Partner

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey® Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1952-1955**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1955	Surveyed N/A
Revised 1955	Revised N/A
Edition 1956	Edition N/A
Copyright N/A	Copyright N/A
Levelled 1949	Levelled N/A

GroundSure

Ordnance Survey® Licensed Partner

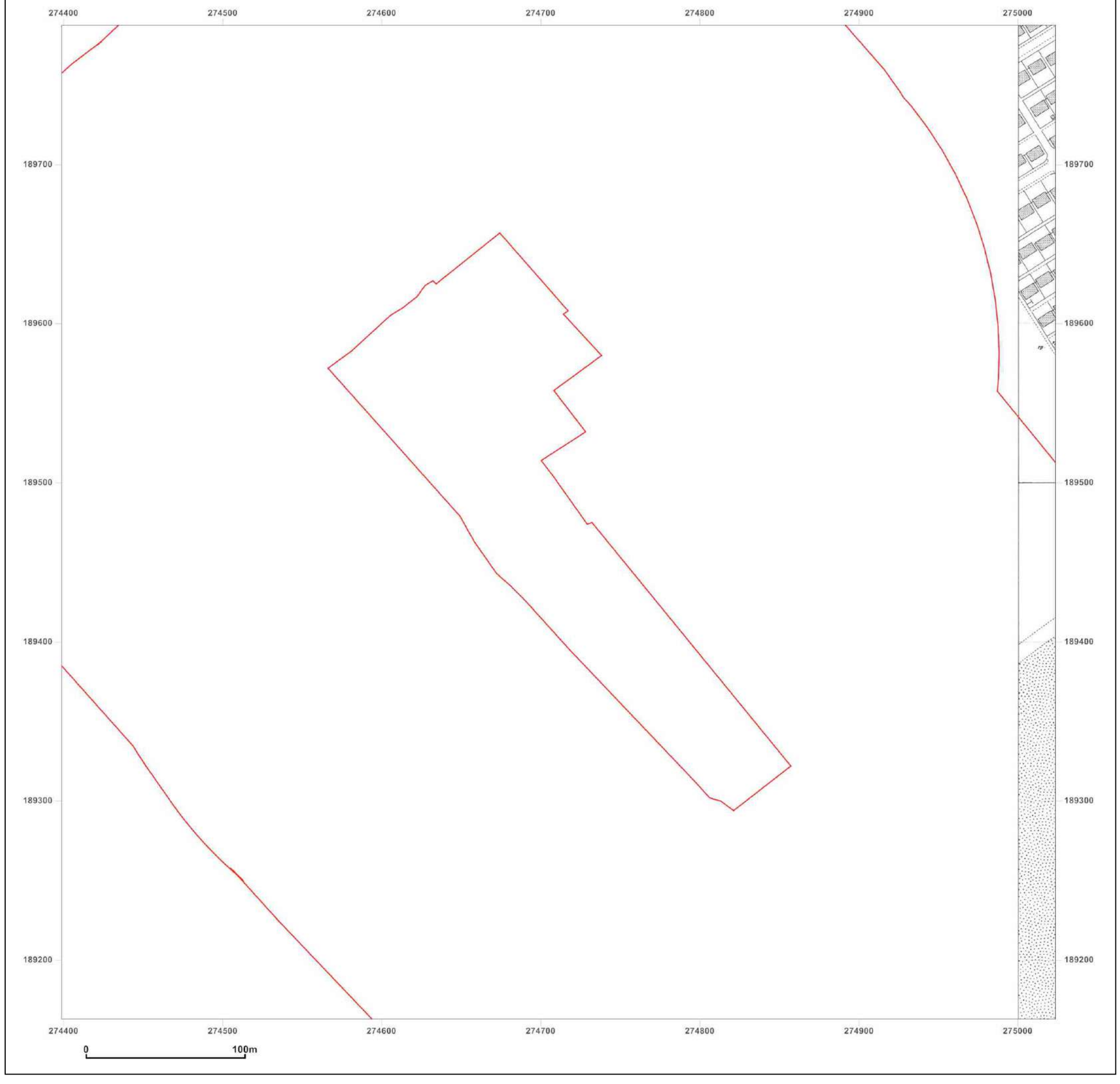
Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

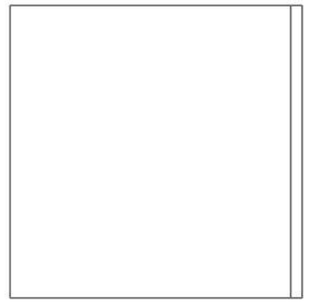
Map Name: National Grid

Map date: **1951**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S



Surveyed 1951
Revised 1951
Edition N/A
Copyright N/A
Levelled N/A

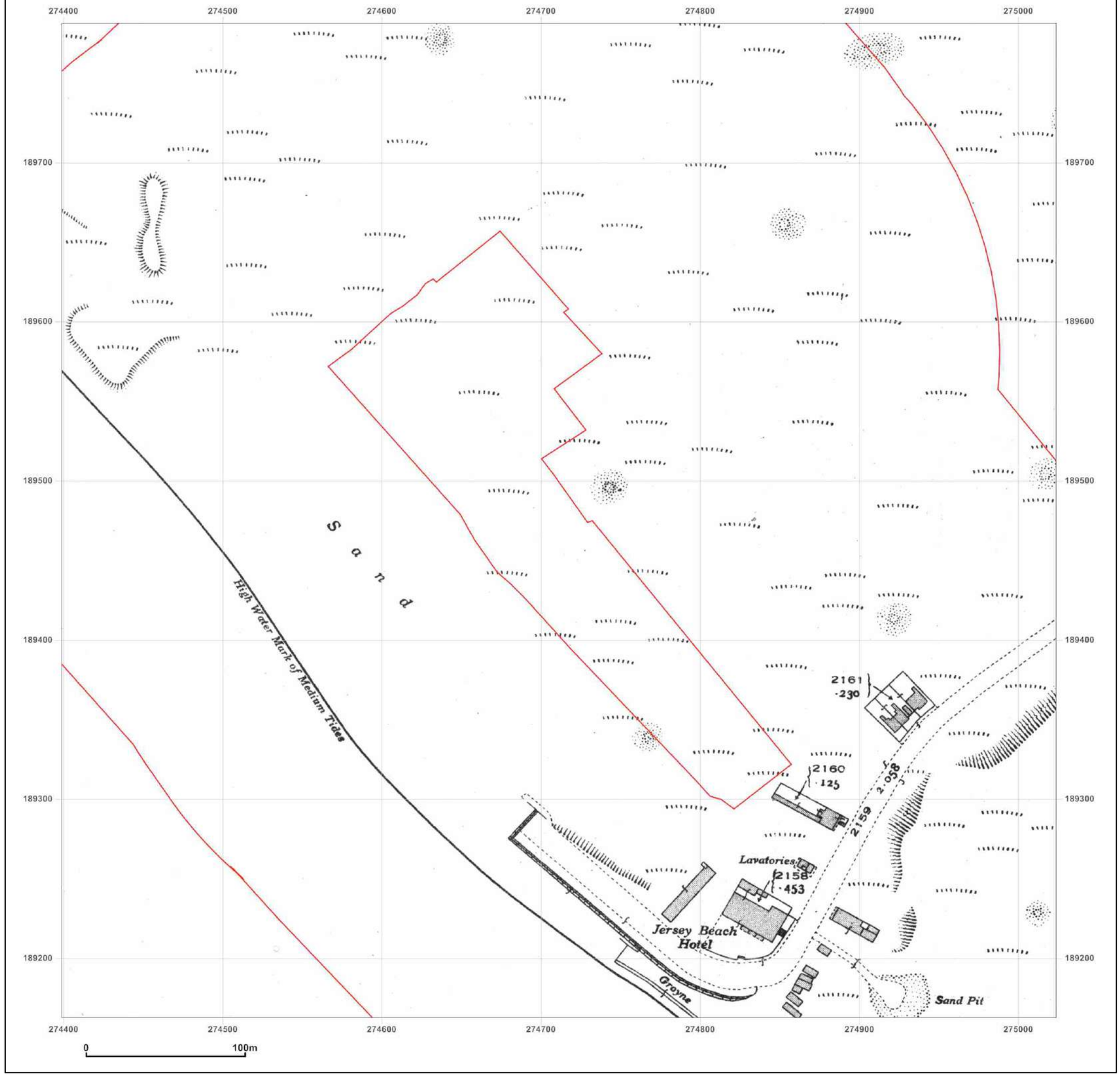
Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1939**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1939
Revised 1939
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

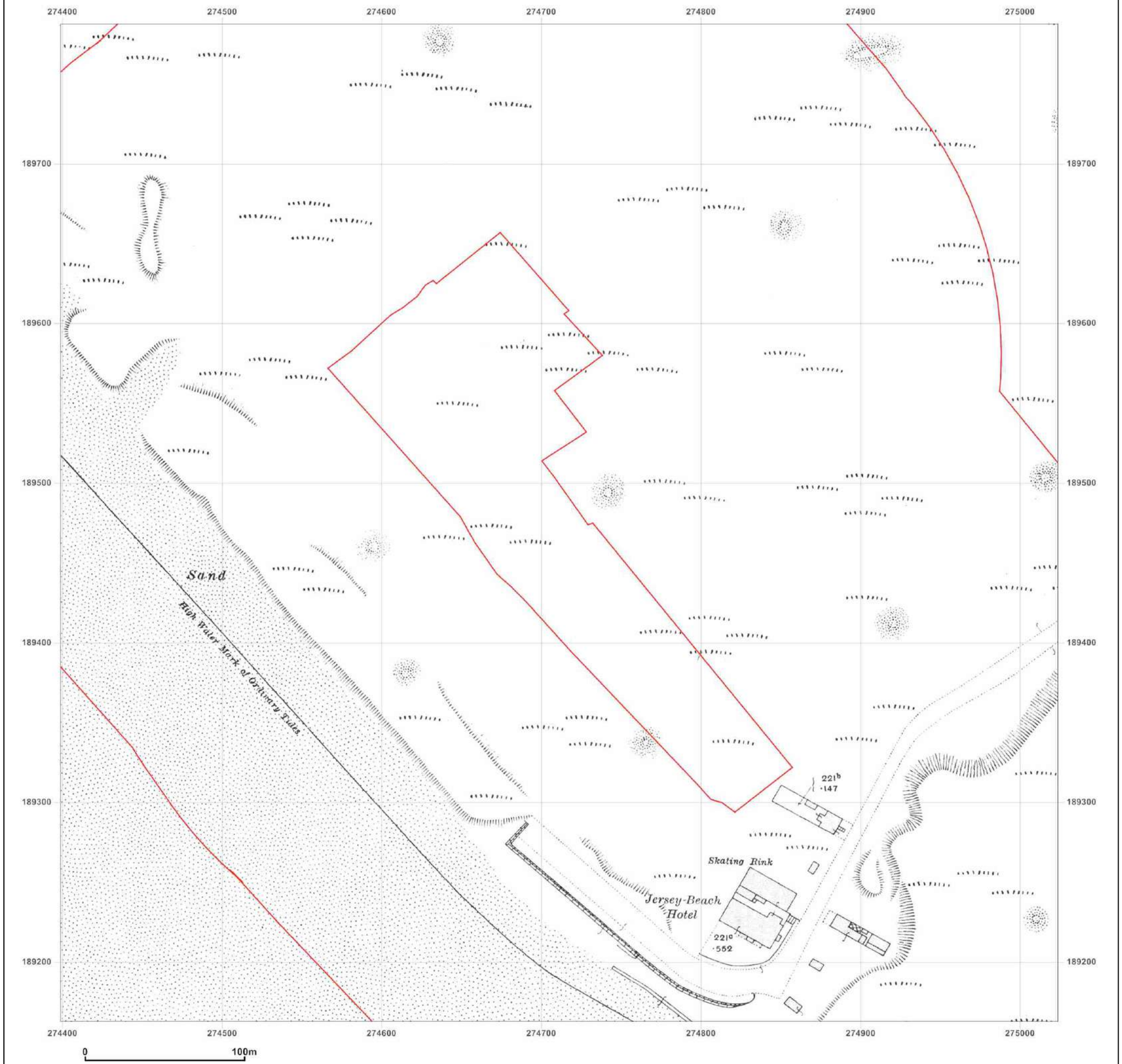
Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1917**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1917
Revised 1917
Edition N/A
Copyright N/A
Levelled N/A

Produced by
GroundSure Environmental Insight
www.groundsure.com

Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

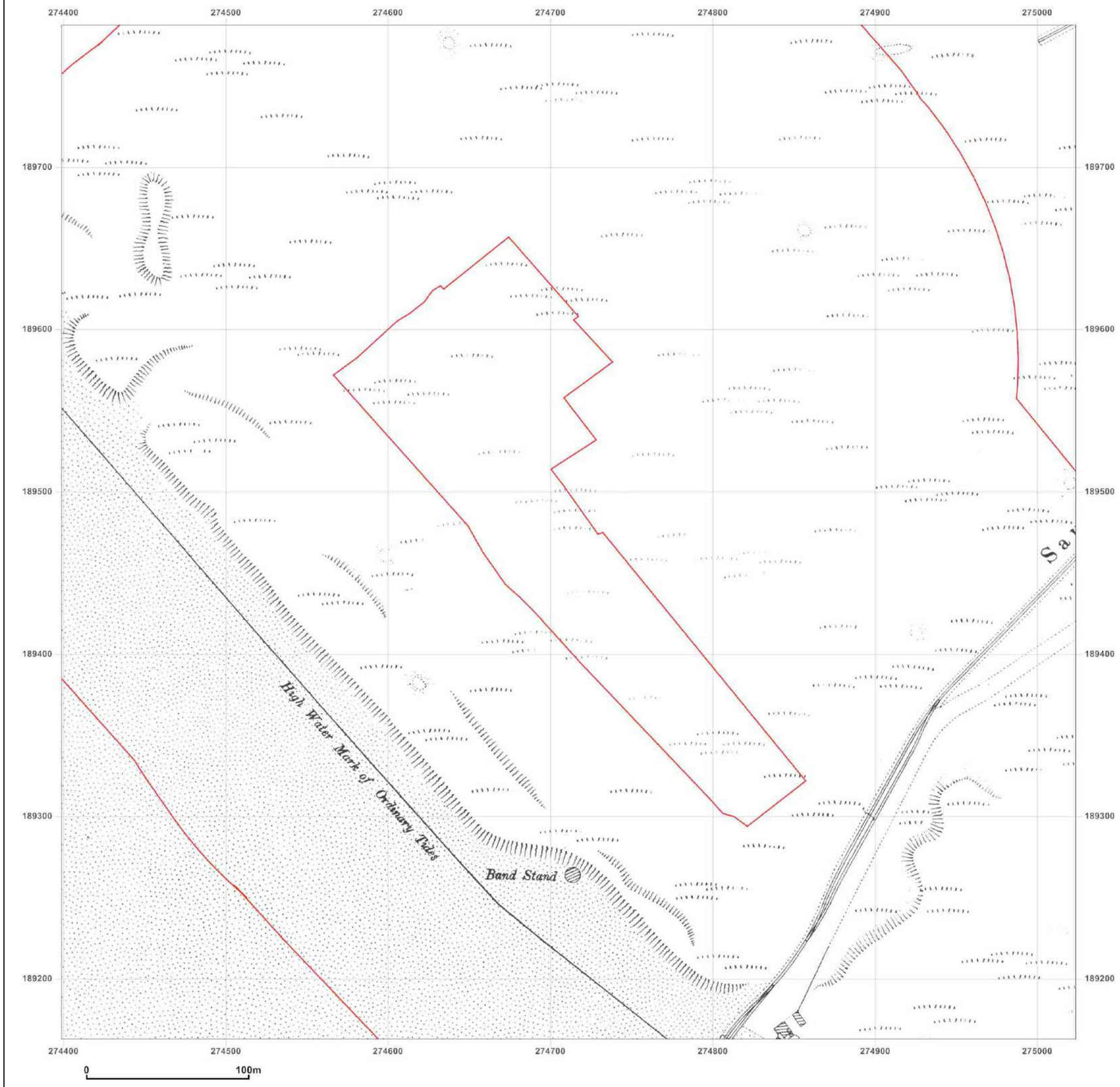
© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com



Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1899**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1899
Revised 1899
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

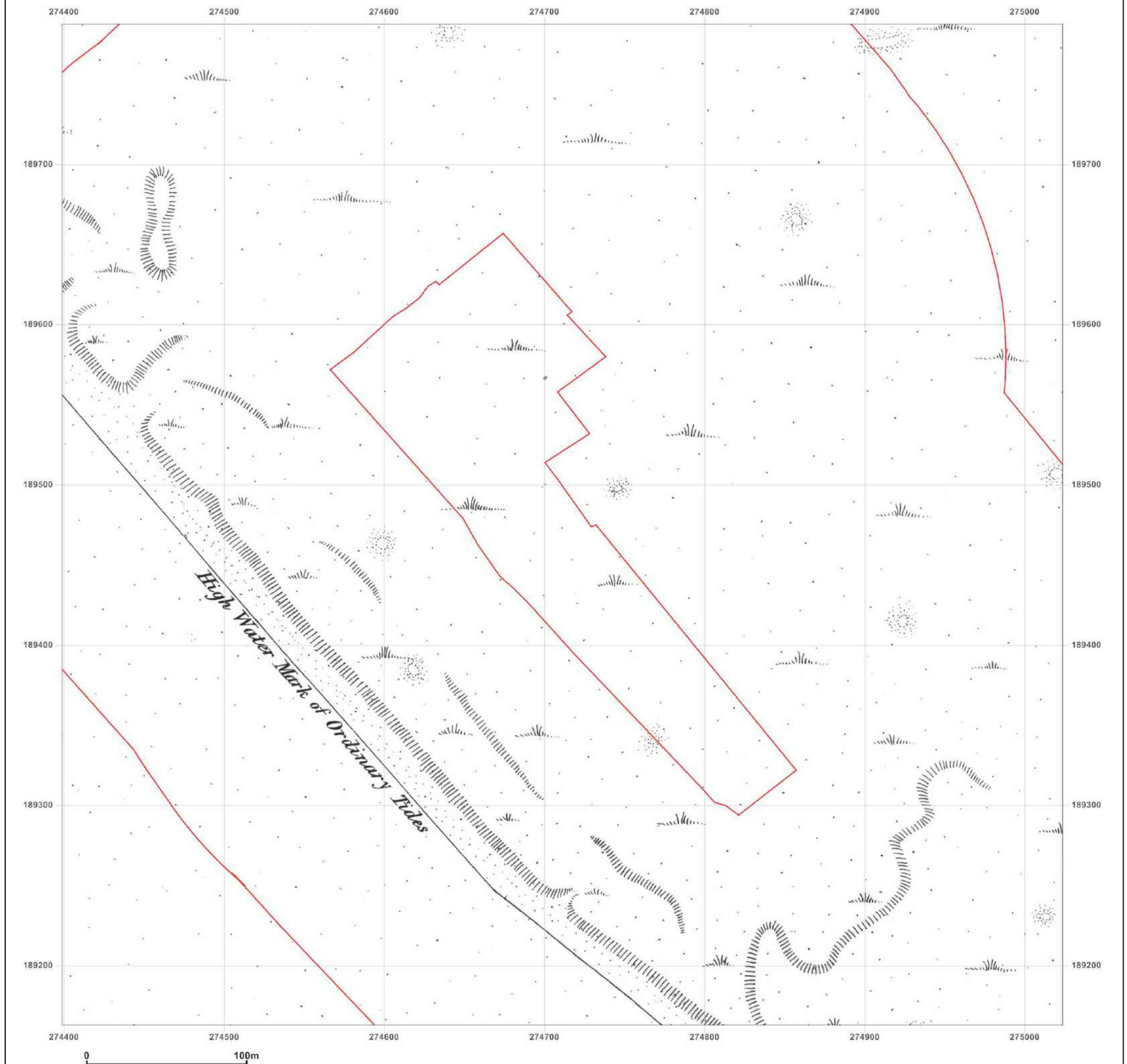
Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1881**

Scale: 1:2,500

Printed at: 1:2,500

N
W E
S

Surveyed 1881
Revised 1881
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Ordnance Survey® Licensed Partner

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **2012**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2012

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: 1:10,000 Raster

Map date: **2002**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

2002

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1991-1995**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1977
Revised 1995
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1991
Revised 1991
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

Ordnance Survey Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: National Grid

Map date: **1978-1979**

Scale: 1:10,000

Printed at: 1:10,000

N
W E
S

Surveyed 1977
Revised 1978
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1977
Revised 1978
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1977
Revised 1979
Edition N/A
Copyright N/A
Levelled N/A

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

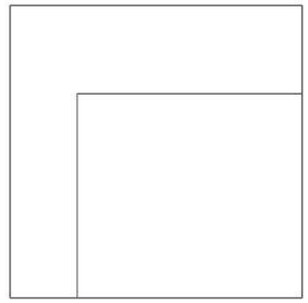
Map Name: Provisional

Map date: **1965**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Surveyed 1965
Revised 1965
Edition N/A
Copyright N/A
Levelled N/A

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: Provisional

Map date: **1957-1962**

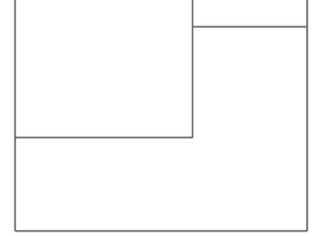
Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1962
Revised 1962
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1957
Revised 1957
Edition N/A
Copyright N/A
Levelled N/A



GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1947-1949**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1875
Revised 1947
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1875
Revised 1947
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1875
Revised 1875
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

Ordnance Survey Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

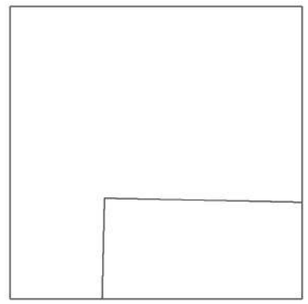
Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Surveyed N/A
Revised N/A
Edition N/A
Copyright N/A
Levelled N/A

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

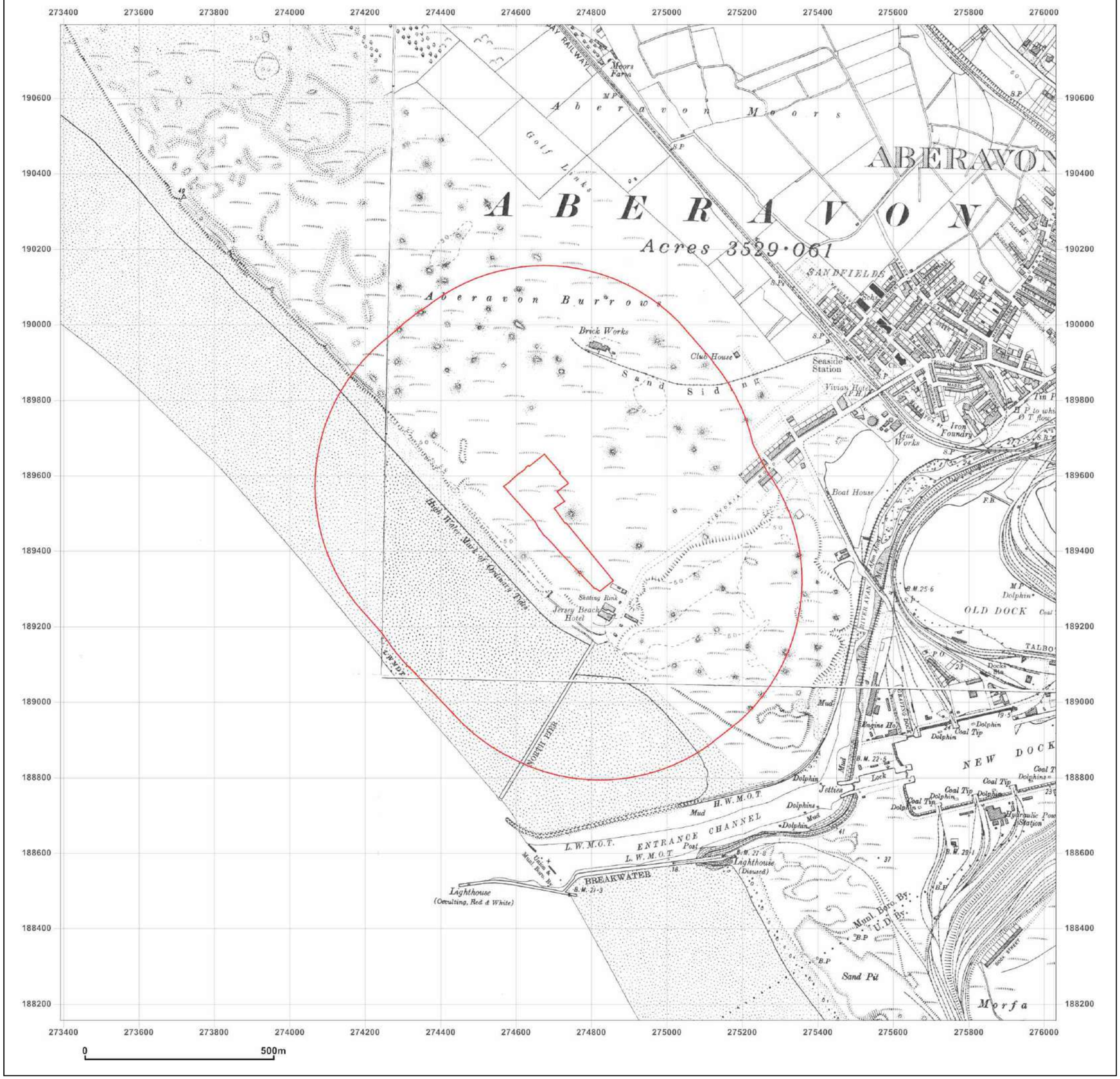
© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com



Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1921**

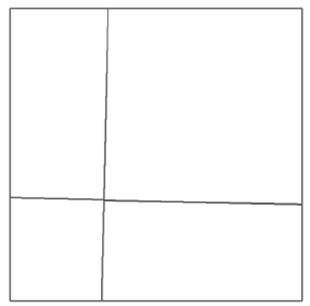
Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1877
Revised 1921
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1875
Revised 1921
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1875
Revised 1921
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Ordnance Survey® Licensed Partner

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

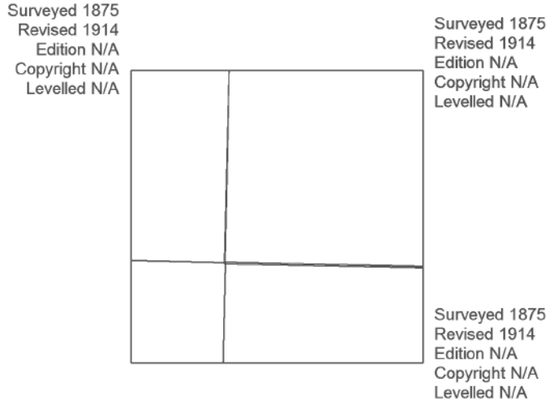
Map Name: County Series

Map date: **1914**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

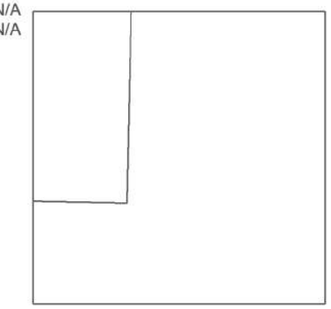
Map date: **1914**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1875
Revised 1914
Edition N/A
Copyright N/A
Levelled N/A



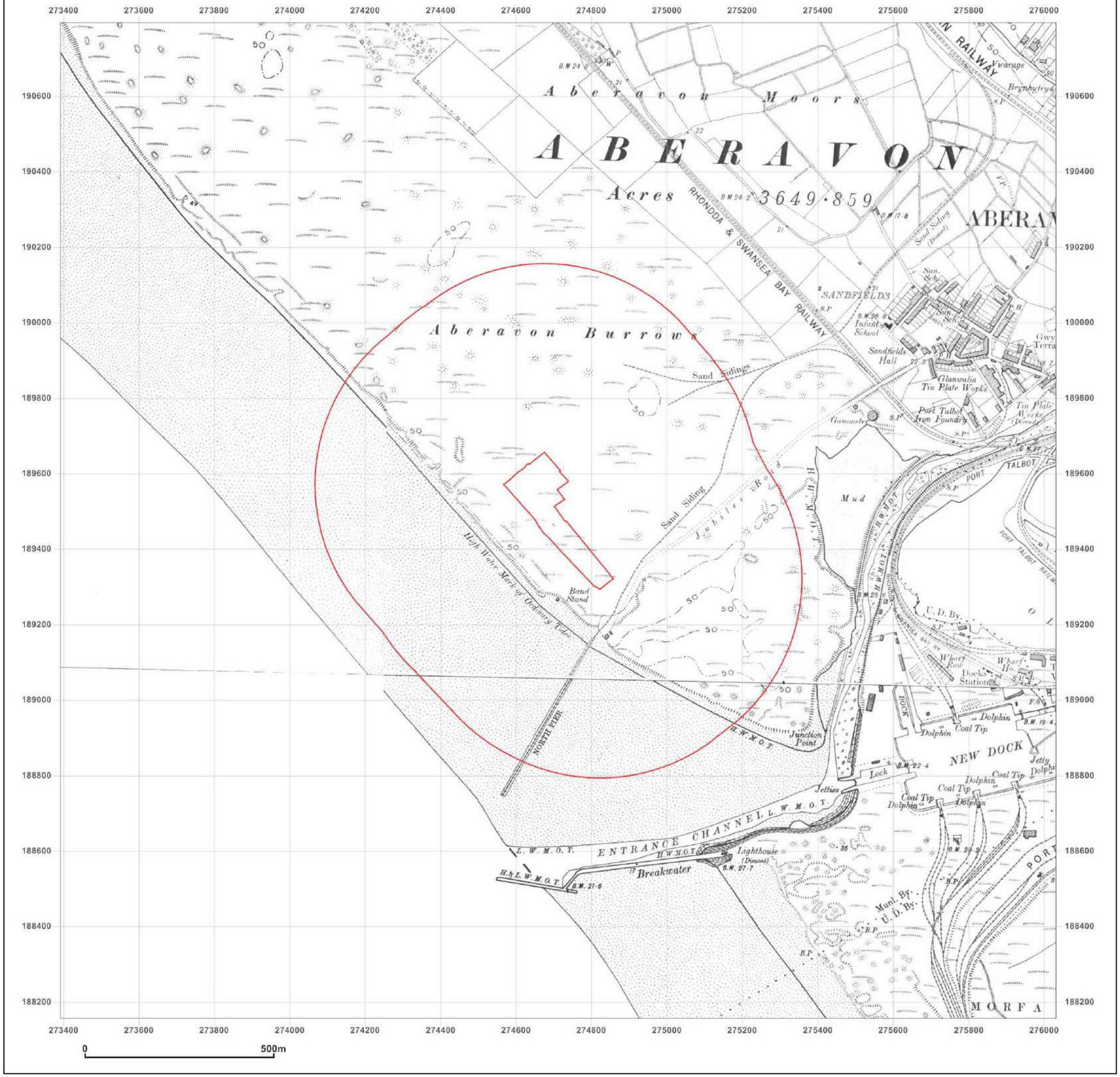
Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey® Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1897-1900**

Scale: 1:10,560

Printed at: 1:10,560

N W E S

Surveyed 1877
Revised 1897
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1876
Revised 1897
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1876
Revised 1900
Edition N/A
Copyright N/A
Levelled N/A

GroundSure

Produced by
GroundSure Environmental Insight
www.groundsure.com

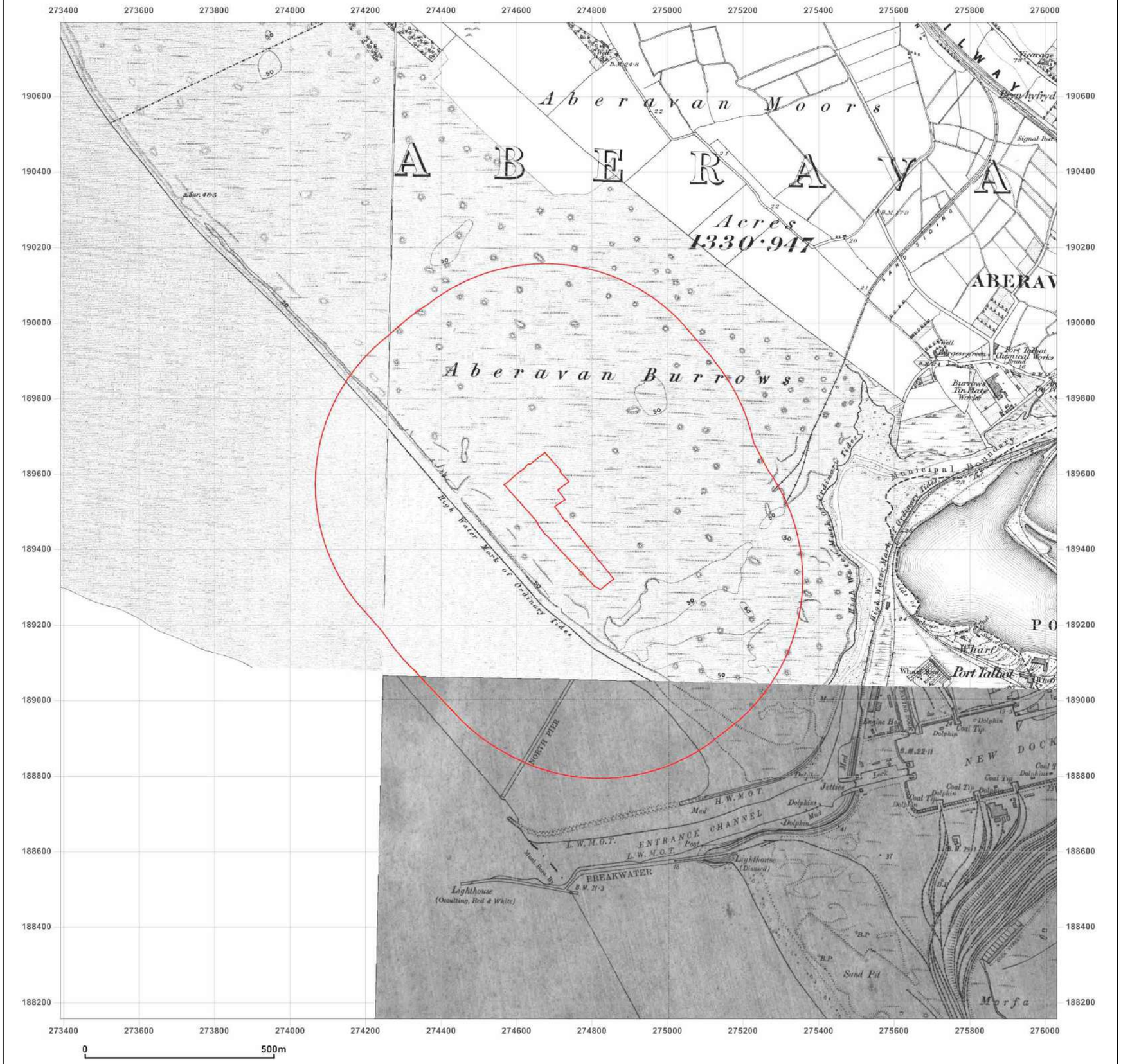
Ordnance Survey® Licensed Partner

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*



Ordnance Survey® Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

Map Name: County Series

Map date: **1875-1877**

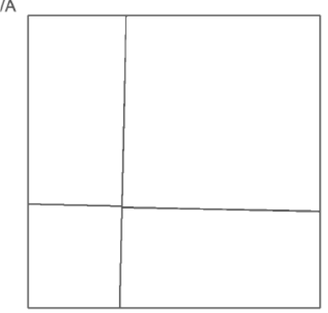
Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1877
Revised 1877
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1877
Revised 1877
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1875
Revised 1875
Edition N/A
Copyright N/A
Levelled N/A

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Ordnance Survey®
Historical Mapping Extract

www.centremaps*live*.com

Site Details:

,

Client Ref: 18278
Report Ref: CMAPS-CM-256601-18278-100913HIS
Grid Ref: 274711, 189475

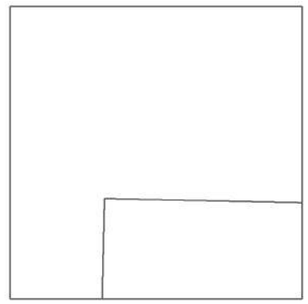
Map Name: County Series

Map date: **1876**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S



Surveyed 1876
Revised 1876
Edition N/A
Copyright N/A
Levelled N/A

Produced by
GroundSure Environmental Insight
www.groundsure.com

Supplied by:
www.centremapslive.com
groundsure@centremaps.com

© Crown copyright and database rights 2013 Ordnance Survey 100035207

Production date: 10 September 2013

To view map legend click here *Legend*

Appendix C – Coal Mining Report (4 A4 Sheets)

Issued by:
The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0845 762 6848 DX 716176 MANSFIELD 5

CLARKEBOND (UK) LIMITED
129 CUMBERLAND ROAD
BRISTOL
BS1 6UY

Our reference:	**51000370478001**
Your reference:	**WB03278 Afan Lido**
Date of your enquiry:	**10 September 2013**
Date we received your enquiry:	**10 September 2013**
Date of issue:	**10 September 2013**

This report is for the property described in the address below and the attached plan. The report is issued subject to the terms and conditions attached, which you are strongly advised to read.

Non-Residential Ground Stability Report - On Coalfield

AFAN LIDO, PRINCESS MARGARET WAY, PORT TALBOT, SA12 6QW

This report is based on and limited to the records in the possession of the Coal Authority; the records and geological interpretation of The British Geological Survey (BGS) and the records of the Cheshire Brine Subsidence Compensation Board, at the time the search is answered.

Coal mining	See comments below
Shrinkable clay	No
Running sand	See comments below
Compressible deposits	No
Collapsible deposits	No
Landslide potential	See comments below
Soluble rocks	No
Brine Compensation District	No

Information from the Coal Authority

Underground coal mining

Past

According to the records in our possession, the property is not within the zone of likely physical influence on the surface from past underground workings.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

All rights reserved. You must not reproduce, store or transmit any part of this document unless you have our written permission.
© The Coal Authority © NERC

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

Coal mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

Opencast coal mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of support

The property is not in an area for which a notice of entitlement to withdraw support has been published.

The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working facilities orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to owners of former copyhold land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

© The Coal Authority © NERC

Information from the British Geological Survey on potential for natural ground movement

Shrinkable clay

The property is not in an area underlain by shrinkable clay.

Running sand

The property is in an area underlain by sand. Some sands, if voids are present, may flow if they come into contact with water.

However, such movement is unlikely to occur unless substantial changes are made to the ground.

Deposits which could compress

The property is not in an area underlain by deposits which could compress and cause ground movement.

Deposits which could collapse

The property is not in an area underlain by deposits which could collapse and cause ground movement.

Natural landslide activity

The property is in an area where the local geology and steepness of slope could combine to create the likelihood of landslide activity.

Landslide activity is unlikely to occur unless substantial changes are made to the ground and/or vegetation, including those caused by drought or excessively wet weather.

Soluble rocks

The property is not in an area underlain by soluble rocks.

Comments on the British Geolological Survey information

These features should not necessarily give cause for concern.

Whether or not a property is affected by ground movement can depend on a number of factors such as its age, type of construction, and on its surroundings and such matters as drainage and nearby trees.

Since 1992 buildings should have been designed and constructed according to buildings regulations to ensure natural ground movement will not cause damage to a building.

However, you should consider the possible consequences before you:

- carry out any building or excavation work;
- alter the ground surface or drainage of surface or ground water; or
- plant or remove large shrubs or trees

Ground movement can cause uneven damage or subsidence to a property.

Developers should always carry out an appropriate risk assessment before starting any work on, or around, a property.

If you own the property and it is damaged by ground movement: You should contact your insurance company and anyone else who has an interest in the property, for example, the mortgage lender.

If you are considering buying the property and BGS has identified that ground movement could occur you should tell your professional advisers.

Information from the Cheshire Brine Subsidence Compensation Board

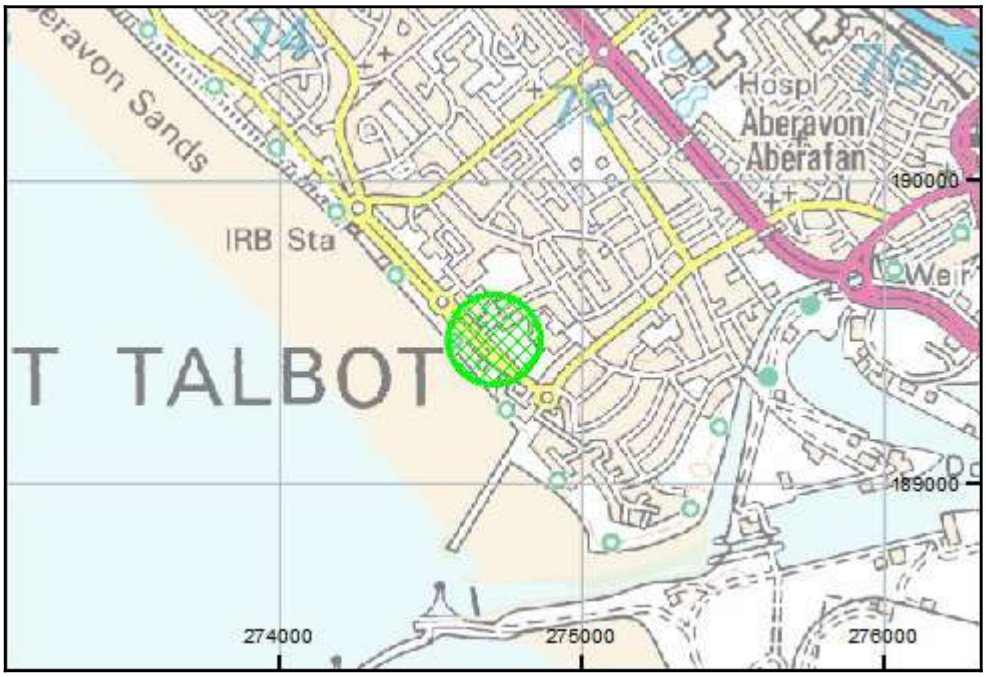
The property lies outside the Cheshire Brine Compensation District.

Additional Remarks

This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority, British Geological Survey and the Cheshire Brine Subsidence Compensation Board's Terms and Conditions 2006. These are available to view at www.groundstability.com or by contacting the Coal Authority's customer service team on 0845 762 6848 or by email to groundstability@coal.gov.uk. These terms and conditions apply regardless of the method used to order and receive reports.

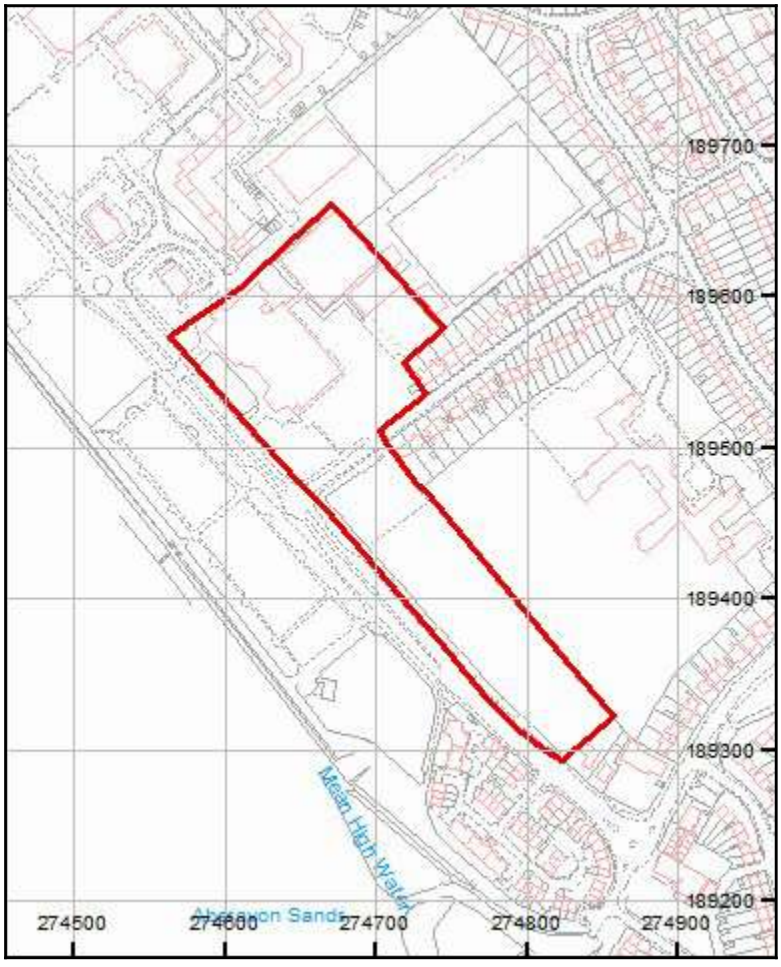
Location map

Approximate position of property



Enquiry boundary

Reproduced by permission of Ordnance Survey on behalf of HMSO. © Crown copyright and database right 2013. All rights reserved. Ordnance Survey Licence number: 100020315



Key

Approximate position of enquiry boundary shown

Mapping sourced from Ordnance Survey

Appendix D – GroundSure Reports (73 A4 Sheets)

centremapslive.com
the mapping portal from Laser Surveys

CENTREMAPS
Brockamin House, ,
Worcester, WR6 5JU

GroundSure Reference:	CMAPS-CM-256601-18278-100913EDR
Your Reference:	18278
Report Date:	10 Sep 2013
Report Delivery Method:	**Email - pdf**
Client Email:	andy@centremaps.com

GroundSure EnviroInsight

Address: ,

Dear Sir/Madam,

Thank you for placing your order with CENTREMAPS. Please find enclosed the GroundSure EnviroInsight as requested

If you need any further assistance, please do not hesitate to contact our helpline on 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.
GroundSure EnviroInsight

centremapslive.com
the mapping portal from Laser Surveys

GroundSure
ENVIRONMENTAL INSIGHT

GroundSure EnviroInsight

Address: ,

Date: 10 Sep 2013

GroundSure Reference: CMAPS-CM-256601-18278-100913EDR

Your Reference: 18278

Client: CENTREMAPS



Brought to you by CENTREMAPS

Aerial Photograph of Study Site

▲
N

NW NE



◄W E►

SW S SE
▼

Aerial photography supplied by Getmapping PLC.
© Copyright Getmapping PLC 2003. All Rights Reserved.

Site Name: ,
Grid Reference: 274711,189475
Size of Site: 3.10 ha

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary					
1. Environmental Permits, Incidents and Registers	on-site	0-50	51-250	251-500	501-1000	1000-1500
1.1 Industrial Sites Holding Environmental Permits and/or Authorisations						
Records of historic IPC Authorisations	0	0	0	0	-	-
Records of Part A(1) and IPPC Authorised Activities	0	0	0	0	-	-
Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0	-	-
Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0	-	-
Records of List 1 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of List 2 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of Part A(2) and Part B Activities and Enforcements	0	0	0	1	-	-
Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0	-	-
Records of Licensed Discharge Consents	0	0	0	0	-	-
Records of Planning Hazardous Substance Consents and Enforcements	0	0	0	0	-	-
1.2 Records of COMAH and NIHHS sites	0	0	0	0	-	-
1.3 Environment Agency Recorded Pollution Incidents						
National Incidents Recording System, List 2	1	0	5	-	-	-
National Incidents Recording System, List 1	0	0	0	-	-	-
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0	0	0	-	-
2. Landfill and Other Waste Sites	on-site	0-50	51-250	251-500	501-1000	1000-1500
2.1 Landfill Sites						
Environment Agency Registered Landfill Sites	0	0	0	0	0	-
Landfill Data – Operational Landfill Sites	0	0	0	0	0	-
Environment Agency Historic Landfill Sites	0	0	0	0	0	0
Landfill Data – Non-Operational Landfill Sites	0	0	0	0	0	-
BGS/DoE Landfill Site Survey	0	0	0	0	0	0
GroundSure Local Authority Landfill Sites Data	0	0	0	0	1	1
2.2 Landfill and Other Waste Sites Findings						
Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Environment Agency Licensed Waste Sites	0	0	0	0	0	9

3. Current Land Uses	on-site	0-50	51-250	251-500	501-1000	1000-1500
3.1 Current Industrial Sites Data	1	1	1	-	-	-
3.2 Records of Petrol and Fuel Sites	0	0	0	1	-	-
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0	-	-

4. Geology	Description
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site? *	No
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site? *	Yes
4.3 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
Source: Scale: 1:50,000 BGS Sheet 247	

* This includes an automatically generated 50m buffer zone around the site.

5. Hydrogeology and Hydrology	on-site	0-50	51-250	251-500	501-1000	1001-2000
5.1 Are there any records of Productive Strata in the Superficial Geology within 500m of the study site?				Yes		
5.2 Are there any records of Productive Strata in the Bedrock Geology within 500m of the study site?				Yes		
5.3 Groundwater Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	0
5.4 Surface Water Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	5
5.5 Potable Water Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	0
5.6 Are there any Source Protection Zones within 500m of the study site?					No	

5.7 River Quality	on-site	0-50	51-250	251-500	501-1000	1001-1500
Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	Yes
5.8 Detailed River Network entries within 500m of the site	0	0	0	0	-	-
5.9 Surface water features within 250m of the study site	No	No	Yes	-	-	-

6. Flooding	
6.1 Are there any Environment Agency indicative Zone 2 floodplains within 250m of the study site?	Yes
6.2 Are there any Environment Agency indicative Zone 3 floodplains within 250m of the study site?	Yes
6.3 Are there any Flood Defences within 250m of the study site?	No
6.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
6.5 Are there any areas used for Flood Storage within 250m of the study site?	No
6.6 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Moderate
6.7 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	High

7. Designated Environmentally Sensitive Sites	on-site	0-50	51-250	251-500	501-1000	1001-2000
7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
7.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0

7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
7.3 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
7.4 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
7.5 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
7.6 Records of Ramsar sites	0	0	0	0	0	0
7.7 Records of World Heritage Sites	0	0	0	0	0	0
7.8 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
7.9 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
7.10 Records of National Parks	0	0	0	0	0	0
7.11 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
7.12 Records of Nitrate Vulnerable Zones	0	0	0	0	0	0
7.13 Records of Ancient Woodlands	0	0	0	0	0	0

8. Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Low

9. Mining

9.1 Are there any coal mining areas within 75m of the study site?	No
9.2 What is the risk of subsidence relating to shallow mining within 150m of the study site?	Low
9.3 Are there any brine affected areas within 75m of the study site?	No

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between GroundSure and the Client. The document contains the following sections:

1. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure underground oil and gas pipelines.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

5. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence.

9. Mining

Provides information on areas of coal and shallow mining.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, GroundSure provide a free Technical Helpline (08444 159000) for further information and guidance.

Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Environmental Permits, Incidents and Registers Map

NW N NE



W E

SW S SE

Authorisations,Incidents and Registers Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

- Site Outline
- Search Buffers (m) 250 / 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- Part A(1) Authorised Processes and Historic IPC Authorisations
- Part A(2) and Part B Authorised Processes
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land
- Hazardous Substance Consents and Enforcements

1.Environmental Permits, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

Records of historic IPC Authorisations within 500m of the study site: **0**

Database searched and no data found.

Records of Part A(1) and IPPC Authorised Activities within 500m of the study site: **0**

Database searched and no data found.

Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site: **0**

Database searched and no data found.

Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site: **0**

Database searched and no data found.

Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site: **0**

Database searched and no data found.

Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site: **0**

Database searched and no data found.

Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site: **1**

The following Part A(2) and Part B Activities are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
7	497.0	NW	274245, 189951	Address: Murco Petroleum Limited, Murco Service Station, Princess Margaret Way, Port Talbot,SA12 7PE Process: Unloading petrol into storage at petrol stations Status: Current Permit Permit Type: Part B	Enforcement: No Enforcements Notified Date of Enforcement: No Enforcements Notified Comment: No Enforcements Notified

Records of Category 3 or 4 Radioactive Substance Licences within 500m of the study site: **0**

Database searched and no data found.

Records of Licensed Discharge Consents within 500m of the study site: **0**

Database searched and no data found.

Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site: **0**

Database searched and no data found.

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: **0**

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

Records of National Incidents Recording System, List 2 within 250m of the study site: **6**

The following NIRS List 2 records are represented as points on the Authorisations, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details	
1	0.0	On Site	274649, 189577	Incident Date: 16/12/2009 Incident Identification: 741055 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 1 (Major)
2A	163.0	E	274900, 189600	Incident Date: 05/04/2001 Incident Identification: 1728 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
3A	163.0	E	274900, 189600	Incident Date: 05/04/2001 Incident Identification: 1728 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
4B	165.0	NE	274995, 189413	Incident Date: 10/12/2001 Incident Identification: 47522 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Dust	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)
5B	165.0	NE	274995, 189413	Incident Date: 28/10/2001 Incident Identification: 39962 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Fumes	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
6	191.0	SE	274971, 189169	Incident Date: 25/03/2003 Incident Identification: 145856 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Dust	Water Impact: Category 4 (No Impact) Land Impact: Category 3 (Minor) Air Impact: Category 3 (Minor)

Records of National Incidents Recording System, List 1 within 250m of the study site: **0**

Database searched and no data found.

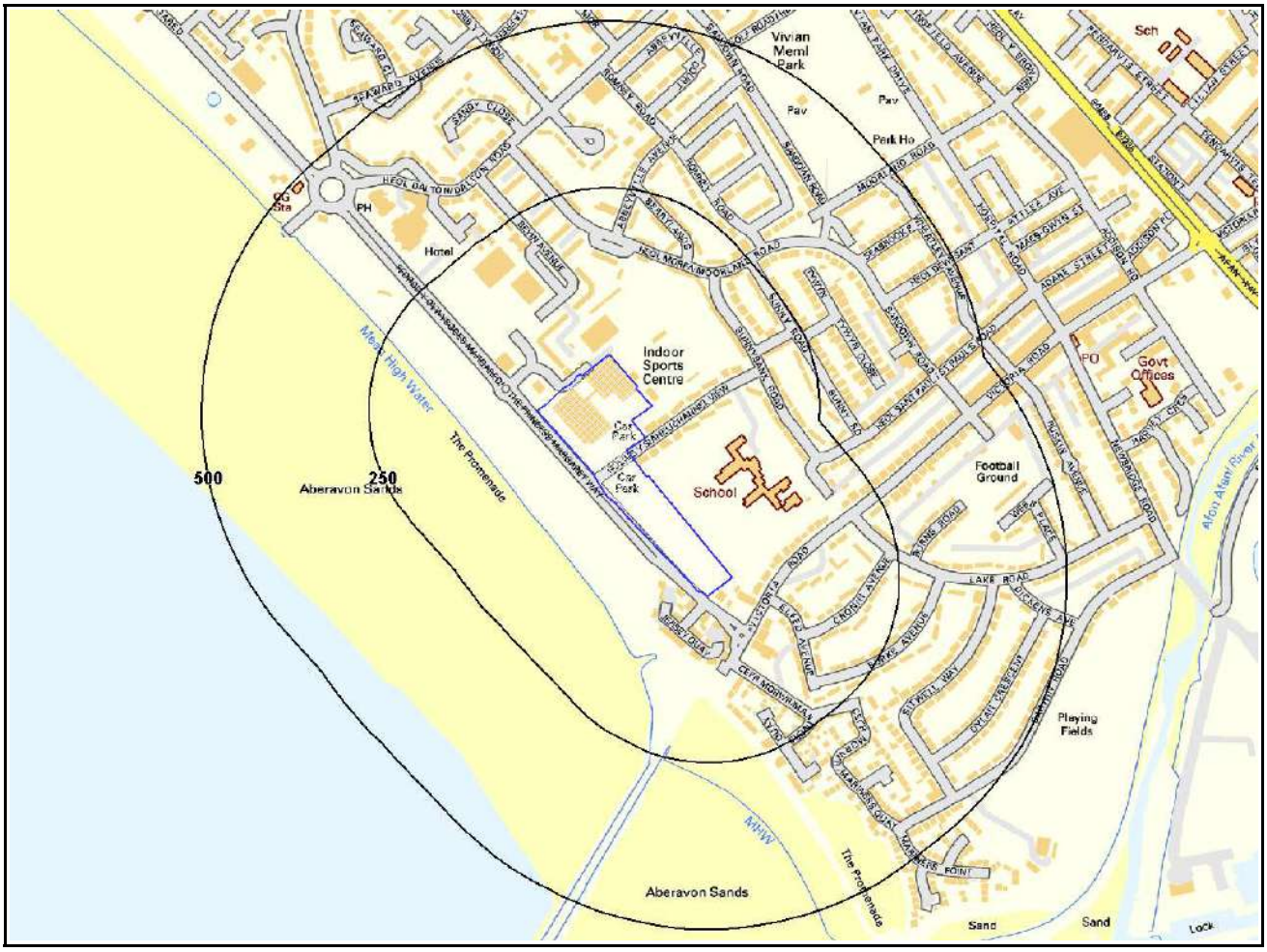
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? **0**

Database searched and no data found.

2. Landfill and Other Waste Sites Map

NW ▲ N NE



◄W E►

SW S ▼ SE

Landfill & Other Waste Sites Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

- Site Outline
- Search Buffers (m): 250, 500
- E.A. Active Landfill
- E.A. Historic Landfill (Area Data)
- E.A. Historic Landfill (Point Data)
- BGS / DoE Survey Landfill
- Local Authority Landfill (Area Data)
- Local Authority Landfill (Point Data)
- Operational Waste Treatment Licence
- Closed Waste Treatment Licence
- REGIS Waste Licence
- Operational Landfill
- Closed Landfill

2. Landfill and Other Waste Sites

2.1 Landfill Sites

Records from Environment Agency landfill data within 1000m of the study site: 0

Database searched and no data found.

Records of operational landfill sites sourced from Landmark within 1000m of the study site: 0

Database searched and no data found.

Records of Environment Agency historic landfill sites within 1500m of the study site: 0

Database searched and no data found.

Records of non-operational landfill sites sourced from Landmark within 1000m of the study site: 0

Database searched and no data found.

Records of BGS/DoE non-operational landfill sites within 1500m of the study site: 0

Database searched and no data found.

Records of Local Authority landfill sites within 1500m of the study site: 2

The following landfill records are represented as points or polygons on the Landfill and Other Waste Sites map:

ID	Distance	Direction	Site Address	Source	Data Type
Not shown	905.0	NE	Refuse Tip	1963 mapping	Polygon
Not shown	1155.0	NE	Refuse Tip	1963 mapping	Polygon

2.2 Other Waste Sites

Records of operational waste treatment, transfer or disposal sites within 500m of the study site: 0

Database searched and no data found.

Records of non-operational waste treatment, transfer or disposal sites within 500m of the study site: 0

Database searched and no data found.

Records of Environment Agency licensed waste sites within 1500m of the study site: 9

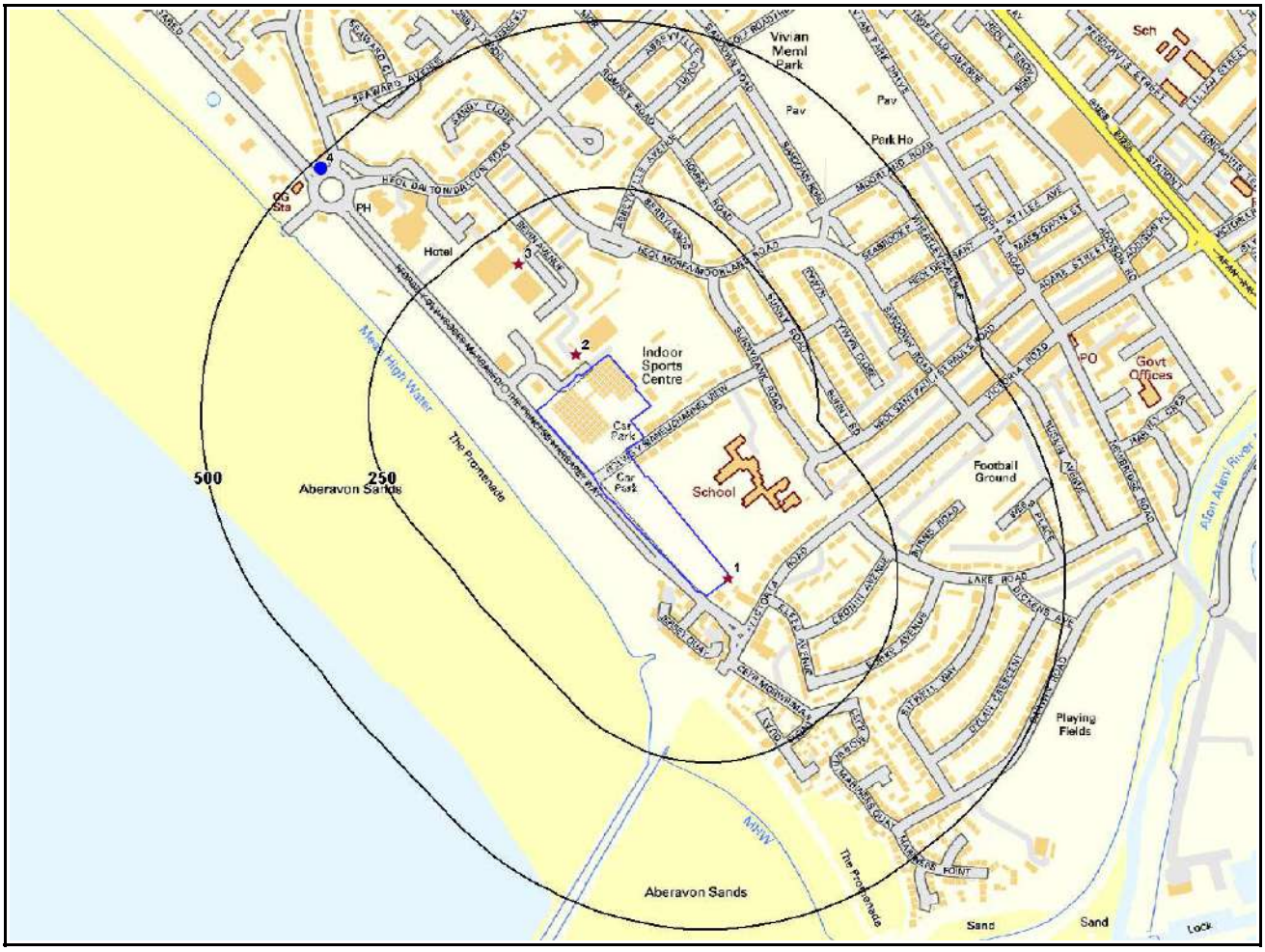
The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
Not shown	1127.0	NE	275501, 190422	Site Address: Neath & Port Talbot Hospital, Baglan Way, Port Talbot, N P T, SA12 7BX Type: Clinical Waste Transfer Station Size: < 25000 tonnes Regis Licence Number: DAL003 EPR reference: EA/EPR/EP3198FW/V002 Operator: Dalkia Utilities Services Plc Waste Management licence No: 34208 Annual Tonnage: 4999.0	Issue Date: 06/06/2003 Effective Date: - Modified: 07/03/2013 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Neath And Port Talbot Hospital Correspondence Address: -, -
Not shown	1299.0	E	276100, 189700	Site Address: Old Byass Works, Docks Road, Port Talbot, N P T, SA13 1ER Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Regis Licence Number: JEM001 EPR reference: EA/EPR/FP3998FH/A001 Operator: Jem Recycling Ltd Waste Management licence No: 34154 Annual Tonnage: 5932.0	Issue Date: 01/04/1998 Effective Date: - Modified: - Surrendered Date: - Expiry Date: 01/04/2000 Cancelled Date: - Status: Expired Site Name: Jem Recycyling 1 Phase 2 Correspondence Address: -, -
Not shown	1299.0	E	276100, 189700	Site Address: Old Byass Works, Docks Road, Port Talbot, SA13 1ER Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Regis Licence Number: JEM001 EPR reference: - Operator: Jem Recycling Ltd Waste Management licence No: 34154 Annual Tonnage: 0.0	Issue Date: 01/04/1998 Effective Date: - Modified: - Surrendered Date: - Expiry Date: 01/04/2000 Cancelled Date: - Status: Expired Site Name: Jem Recycyling 1 Phase 2 Correspondence Address: Martin Harry, Old Byass Works, Docks Road, Port Talbot, SA13 1ER
Not shown	1299.0	E	276100, 189700	Site Address: Byass Works, Docks Road, Port Talbot, SA13 1ER Type: Household, Commercial & Industrial Waste T Stn Size: Unknown Regis Licence Number: JEM003 EPR reference: - Operator: Jem Recycling Ltd Waste Management licence No: 34168 Annual Tonnage: 0.0	Issue Date: 30/03/1994 Effective Date: - Modified: - Surrendered Date: - Expiry Date: 01/04/2000 Cancelled Date: - Status: Expired Site Name: Jem Recycling 1 Port Talbot Skips Correspondence Address: -, Byass Works, Docks Road, Port Talbot, SA13 1ER
Not shown	1299.0	E	276100, 189700	Site Address: Old Byass Works, Docks Road, Port Talbot, N P T, SA13 1ER Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Regis Licence Number: JEM002 EPR reference: EA/EPR/HP3398FP/A001 Operator: Jem Recycling Ltd Waste Management licence No: 34142 Annual Tonnage: 19274.0	Issue Date: 24/12/1996 Effective Date: - Modified: - Surrendered Date: - Expiry Date: 01/04/2000 Cancelled Date: - Status: Expired Site Name: Jem Recycling 2 Adjoining 1 Correspondence Address: -, -
Not shown	1299.0	E	276100, 189700	Site Address: Old Byass Works, Old Byass Works, Docks Road, Port Talbot, N P T, SA13 1ER Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: JEM003 EPR reference: EA/EPR/CP3898FU/A001 Operator: Jem Recycling Ltd Waste Management licence No: 34168 Annual Tonnage: 25000.0	Issue Date: 30/03/1994 Effective Date: - Modified: - Surrendered Date: - Expiry Date: 01/04/2000 Cancelled Date: - Status: Expired Site Name: Jem Recycling 1 Port Talbot Skips Correspondence Address: -, -
Not shown	1372.0	E	276183, 189674	Site Address: Former Byass Works, Docks Road, Port Talbot, N P T, SA13 1RS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: DRA001 EPR reference: - Operator: Draig Recycling Ltd Waste Management licence No: 34283 Annual Tonnage: 24999.0	Issue Date: 25/08/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Paper Dragon Correspondence Address: -, Former Byass Works, Docks Road, Port Talbot, N P T, SA13 1RS

Not shown	1372.0	E	276183, 189674	Site Address: Former Byass Works, Docks Road, Port Talbot, N P T, SA13 1RS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: EGA006 EPR reference: EA/EPR/LB3933DA/V002 Operator: Egan Metal Recycling Limited Waste Management licence No: 34283 Annual Tonnage: 24999.0	Issue Date: 25/08/2006 Effective Date: 23/11/2012 Modified: 04/04/2013 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Port Talbot Recovery Centre Correspondence Address: -, -
Not shown	1372.0	E	276183, 189674	Site Address: Former Byass Works, Docks Road, Port Talbot, N P T, SA13 1RS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: 342083 EPR reference: EA/EPR/JP3898FC/T002 Operator: The Recycling Company Limited Waste Management licence No: 34283 Annual Tonnage: 24999.0	Issue Date: 25/08/2006 Effective Date: 14/02/2007 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: Paper Dragon Correspondence Address: -, -

3. Current Land Use Map

NW ▲ N NE



◄W E►

SW ▼ S SE

Current Land Use Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

250
500
Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Underground High Pressure Oil & Fuel Pipelines

3. Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 3

The following records are represented as points on the Current Land Uses map.

ID	Distance	Direction	Company	Address	Activity	Category
1	0.0	On Site	Electricity Sub Station	SA12	Electrical Features	Infrastructure and Facilities
2	29.0	NW	Electricity Sub Station	SA12	Electrical Features	Infrastructure and Facilities
3	189.0	NW	Electricity Sub Station	SA12	Electrical Features	Infrastructure and Facilities

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 1

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance	Direction	NGR	Company	Address	LPG	Status
4	485.0	NW	274245, 189936	Murco	Port Talbot Murco Service Station, Princess Margaret Way, Princess Margaret Way, Aberavon, Port Talbot, West Glamorgan, SA12 7PE	No	Open

3.3 Underground High Pressure Oil and Gas Pipelines

Records of high pressure underground pipelines within 500m of the study site: 0

Database searched and no data found.

4. Geology

4.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

4.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
BSA-SAND	BLOWN SAND	SAND

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

4.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

LEX Code	Description	Rock Type
SWMCM-MDSS	SOUTH WALES MIDDLE COAL MEASURES FORMATION	MUDSTONE, SILTSTONE AND SANDSTONE

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

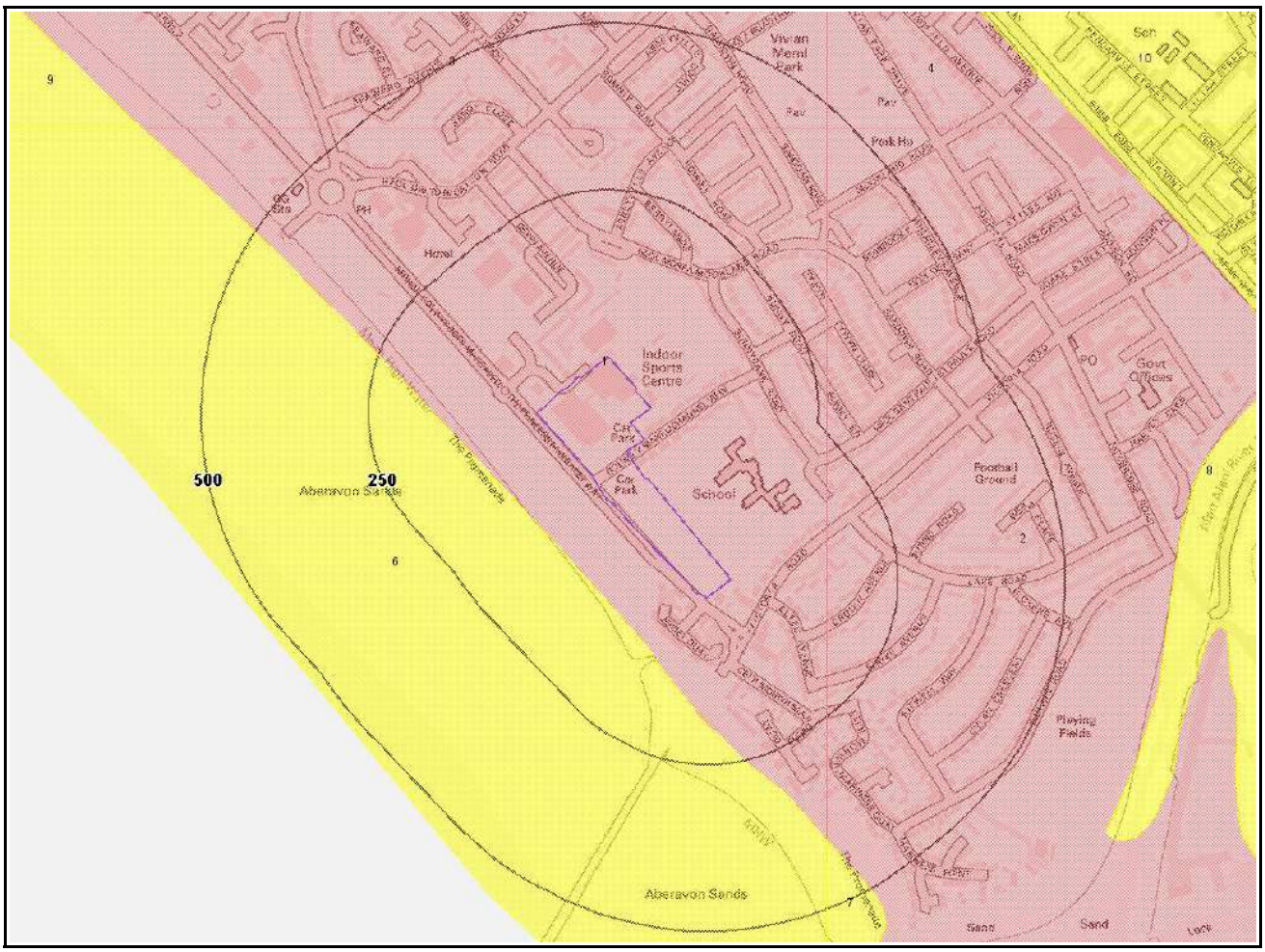
For more detailed geological and ground stability data please refer to the "GroundSure GeoInsight". Available from our website.

5a. Hydrogeology - Aquifer Within Superficial Geology

NW N NE

W E

SW S SE



Aquifer Within Superficial Geology Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

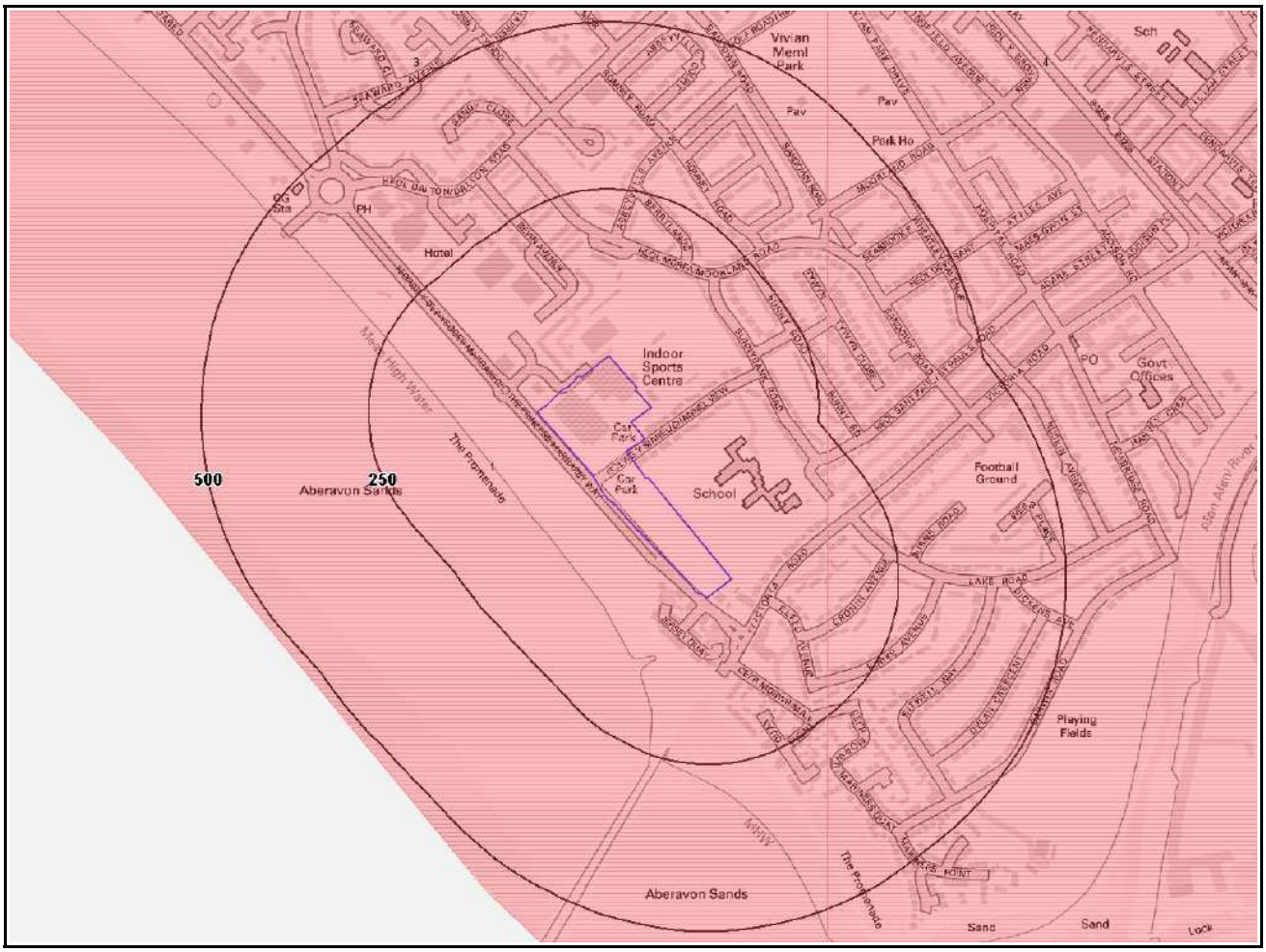
Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

5b. Hydrogeology - Aquifer Within Bedrock Geology and Abstraction Licenses

NW N NE



W E

SW S SE

Aquifer Within Bedrock Geology Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

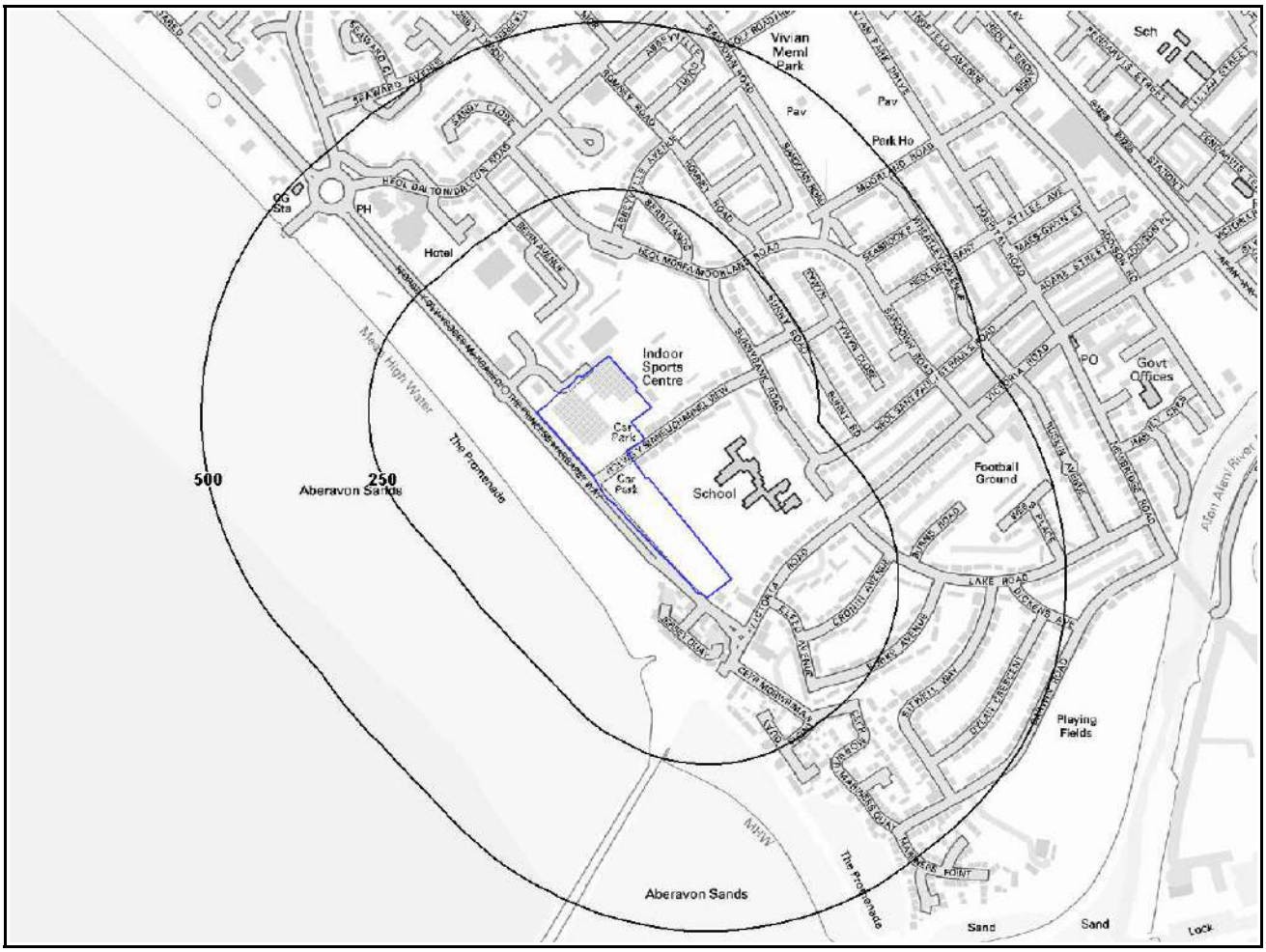
Surface Water Abstraction Licence

5c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses

NW N NE

W E

SW S SE



SPZ and Potable Water Abstraction Licenses Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2 - Outer Catchment

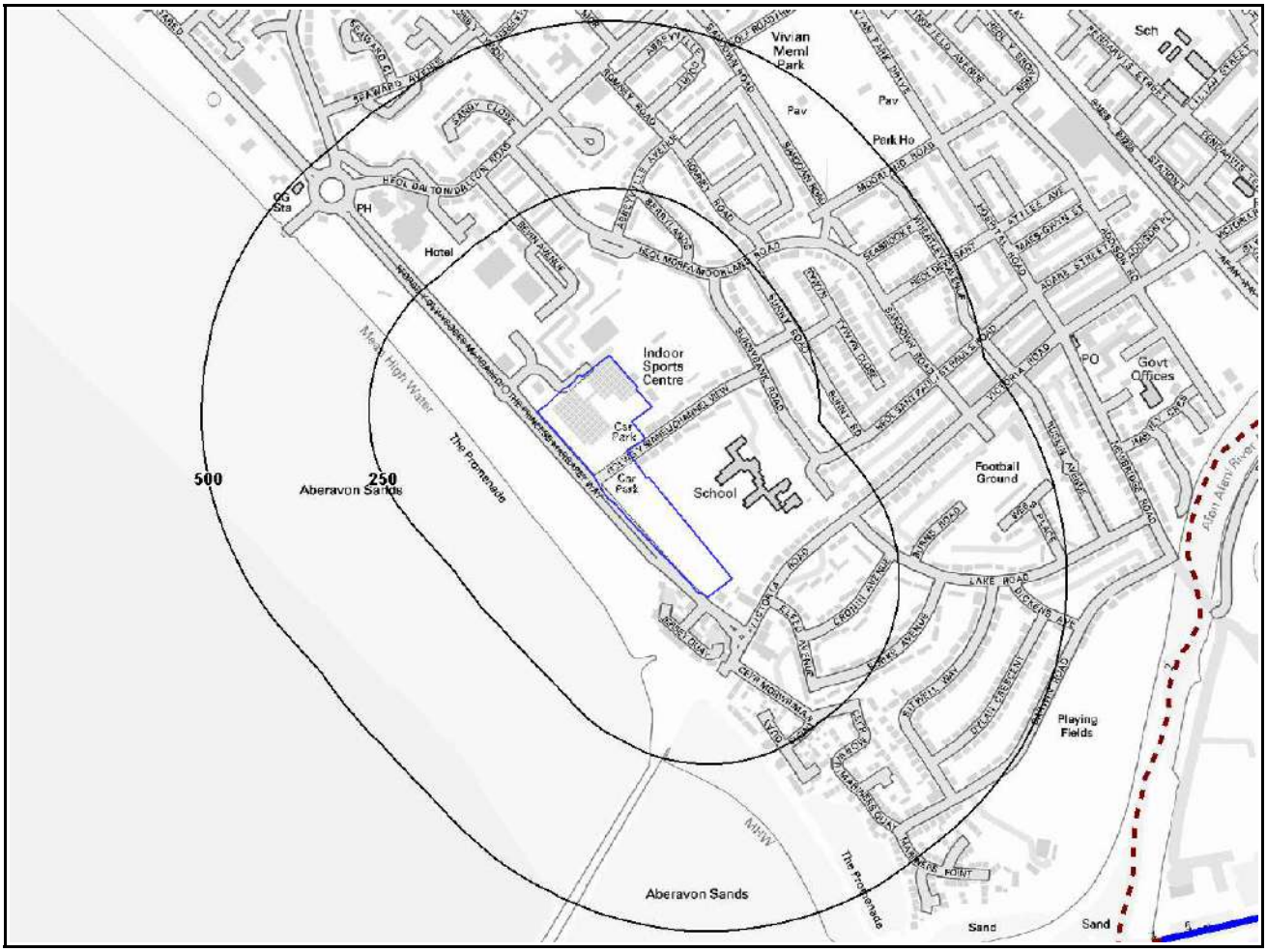
Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

5d. Hydrology – Detailed River Network and River Quality

NW N NE



W E

SW S SE

Hydrology Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

- Site Outline
- 250 / 500 Search Buffers (m)
- Primary River
- Secondary River
- Tertiary River
- Lake/Reservoir
- Underground River (inferred)
- General Quality Assessment: Chemistry
- Canal
- Canal Tunnel
- Extended Culvert (greater than 50m)
- D/S of High Water Mark
- D/S seaward extension
- General Quality Assessment: Biology

5.Hydrogeology and Hydrology

5.1 Aquifer within Superficial Deposits

Are there records of productive strata within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the GroundSure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (5a):

ID	Distance [m]	Direction	Designation	Description
1	0.0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
6	101.0	SW	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
2	143.0	E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
3	343.0	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
7	403.0	SE	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
4	473.0	NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

5.2 Aquifer within Bedrock Deposits

Are there records of productive strata within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the GroundSure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (5b):

ID	Distance [m]	Direction	Designation	Description
1	0.0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	143.0	E	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

ID	Distance [m]	Direction	Designation	Description
3	343.0	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	473.0	NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

5.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? **No**

Database searched and no data found.

5.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? **Yes**

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (5b):

ID	Distance	Direction	NGR	Details	
Not shown	1182.0	E	275980, 189690	Licence No: 21/58/61/0009 Details: Evaporative Cooling Direct Source: Eaw Surface Water Point: River Afan To Port Talbot Docks Data Type: Point	Annual Volume (m³): 14933610 Max Daily Volume (m³): 40914 Application No: NPS/WR/005005 Original Start Date: 25/3/1966 Expiry Date: - Issue No: 101 Version Start Date: 12/11/2010 Version End Date:
Not shown	1182.0	E	275980, 189690	Licence No: 21/58/61/0009 Details: Process Water Direct Source: Eaw Surface Water Point: River Afan To Port Talbot Docks Data Type: Point	Annual Volume (m³): 14933610 Max Daily Volume (m³): 40914 Application No: NPS/WR/005005 Original Start Date: 25/3/1966 Expiry Date: - Issue No: 101 Version Start Date: 12/11/2010 Version End Date:
Not shown	1442.0	E	276230, 188880	Licence No: 21/58/61/0042 Details: Dust Suppression Direct Source: Eaw Surface Water Point: Port Talbot Docks Port Talbot Data Type: Point	Annual Volume (m³): 5000 Max Daily Volume (m³): 49.68 Application No: NPS/WR/002958 Original Start Date: 15/4/2002 Expiry Date: 14/4/2017 Issue No: 4 Version Start Date: 21/5/2010 Version End Date:
Not shown	1442.0	E	276230, 188880	Licence No: 21/58/61/0042 Details: Process Water Direct Source: Eaw Surface Water Point: Port Talbot Docks Port Talbot Data Type: Point	Annual Volume (m³): 5000 Max Daily Volume (m³): 49.68 Application No: NPS/WR/002958 Original Start Date: 15/4/2002 Expiry Date: 14/4/2017 Issue No: 4 Version Start Date: 21/5/2010 Version End Date:
Not shown	1458.0	E	276240, 188860	Licence No: 21/58/61/0042 Details: Dust Suppression Direct Source: Eaw Surface Water Point: Civil & Marine Slag Cement Ltd Quay At Port Talbot Docks Data Type: Point	Annual Volume (m³): 5000 Max Daily Volume (m³): 49.68 Application No: - Original Start Date: 15/4/2002 Expiry Date: 14/4/2017 Issue No: 3 Version Start Date: 12/9/2008 Version End Date:

5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? **No**

Database searched and no data found.

5.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? **No**

Database searched and no data found.

5.7 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? **Yes**

Biological Quality:

Biological Quality data describes water quality in terms of 83 groups of macroinvertebrates, some of which are pollution sensitive. The results are graded from A ('Very Good') to F ('Bad').

The following Biological Quality records are shown on the Hydrology Map (5d):

ID	Distance [m]	Direction	NGR	River Details	Biological Quality Grade				
					2005	2006	2007	2008	2009
Not shown	1299.0	E	276100, 189700	River Name: Afan Reach: Dock Intake Weir - M4 Motorway End/Start of Stretch: End of Stretch NGR	B	B	C	C	C

Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (5d):

ID	Distance [m]	Direction	NGR	River Details	Chemical Quality Grade (Headline Indicator)				
					2005	2006	2007	2008	2009
Not shown	1257.0	E	276047, 189727	River Name: Afan Reach: Dock Intake Weir - M4 Motorway End/Start of Stretch: Sample Point NGR	A	A	A	A	-
Not shown	1299.0	E	276100, 189700	River Name: Afan Reach: Dock Intake Weir - M4 Motorway End/Start of Stretch: End of Stretch NGR	A	A	A	A	-

5.8 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? **No**

Database searched and no data found.

5.9 Surface Water Features

Are there any surface water features within 250m of the study site? **Yes**

The following surface water records are not represented on mapping:

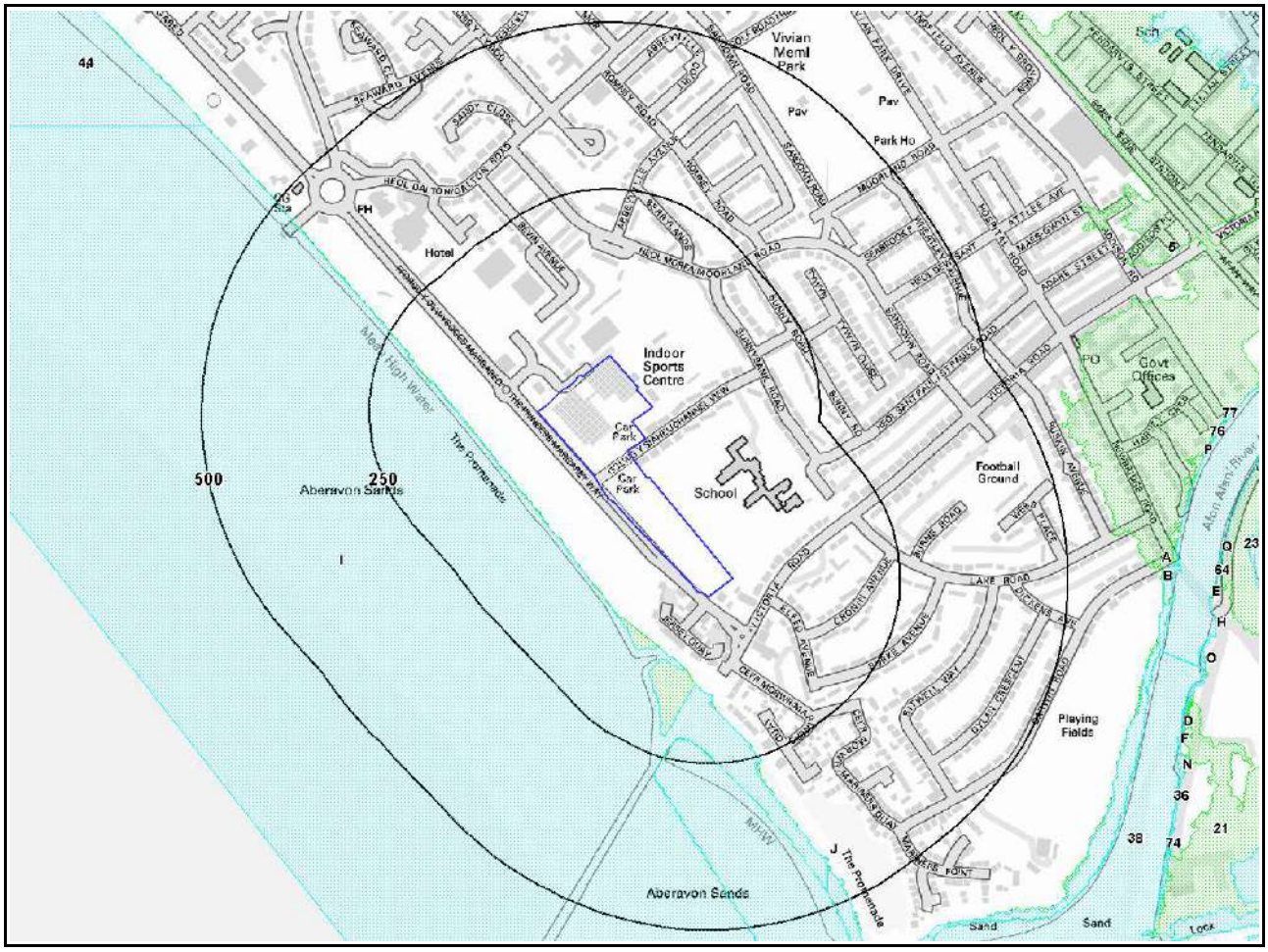
Distance to Surface Water (m)	on-site	0-50	51-250
Surface water features within 250m of the study site	No	No	Yes

This information is taken from Ordnance Survey OpenData™. Contains Ordnance Survey data © Crown copyright and database right 2013.

6. Environment Agency Flood Map

NW ▲ N NE

◄W



E►

SW ▼ S SE

Environment Agency Flood Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

250
500
Search Buffers (m)

Zone 2 Floodplain

Zone 3 Floodplain

Flood Storage Area

Area Benefiting from Flood Defences

Flood Defences

6. Flooding

6.1 Zone 2 Flooding

Zone 2 floodplain estimates the annual probability of flooding as one in one thousand (0.1%) or greater from rivers and the sea but less than 1% from rivers or 0.5% from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 2 floodplain? **Yes**

The following floodplain records are represented as green shading on the Flood Map:

ID	Distance	Direction	Update	Type
1I	91.0	SW	09-Sep-2013	Zone 2 - (Tidal Models)
2	215.0	S	09-Sep-2013	Zone 2 - (Fluvial / Tidal Models)

6.2 Zone 3 Flooding

Zone 3 estimates the annual probability of flooding as one in one hundred (1%) or greater from rivers and a one in two hundred (0.5%) or greater from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 3 floodplain? **Yes**

The following floodplain records are represented as blue shading on the Flood Map:

ID	Distance	Direction	Update	Type
37I	92.0	SW	09-Sep-2013	Zone 3 - (Tidal Models)
38	215.0	S	09-Sep-2013	Zone 3 - (Fluvial / Tidal Models)

6.3 Flood Defences

Are there any Flood Defences within 250m of the study site? **No**

6.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? **No**

6.5 Areas used for Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? **No**

6.6 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site?	**Yes**
What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?	**Moderate**

6.7 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?	**High**

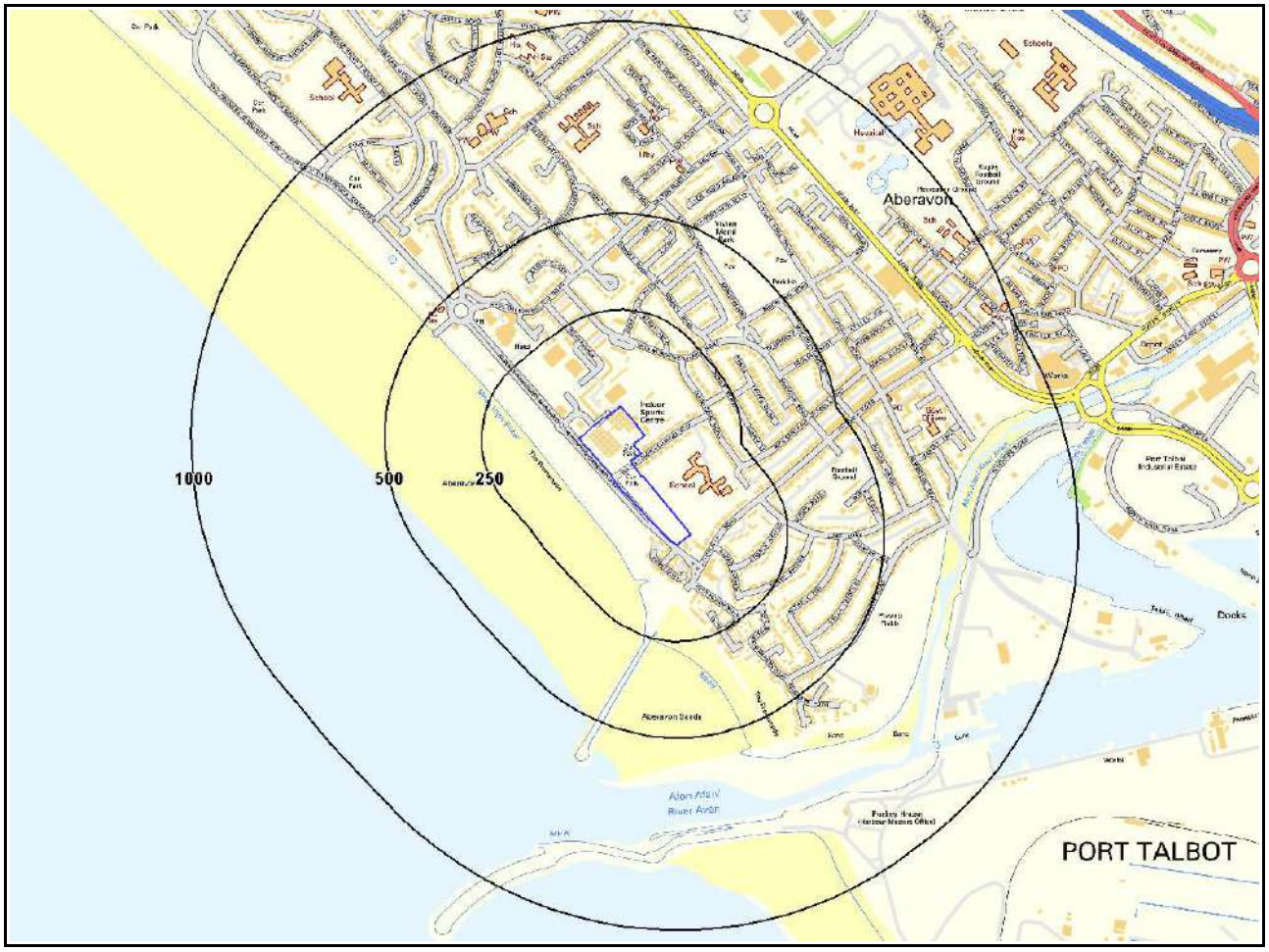
Notes:

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The **confidence rating** is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

7.Designated Environmentally Sensitive Sites Map

NW ▲ N NE



◄W E►

SW ▼ S SE

Designated Environmentally Sensitive Sites Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

- Site Outline
- SAC
- SSSI
- NNR
- World Heritage Sites
- SPA
- Ramsar
- LNR
- Environmentally Sensitive Areas
- Areas of Outstanding Natural Beauty
- Nitrate Vulnerable Zones
- Nitrate Sensitive Areas
- National Parks
- Ancient Woodlands

7.Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site? **No**

Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site: **0**

Database searched and no data found.

Records of National Nature Reserves (NNR) within 2000m of the study site: **0**

Database searched and no data found.

Records of Special Areas of Conservation (SAC) within 2000m of the study site: **0**

Database searched and no data found.

Records of Special Protection Areas (SPA) within 2000m of the study site: **0**

Database searched and no data found.

Records of Ramsar sites within 2000m of the study site: **0**

Database searched and no data found.

Records of Local Nature Reserves (LNR) within 2000m of the study site: **0**

Database searched and no data found.

Records of World Heritage Sites within 2000m of the study site: **0**

Database searched and no data found.

Records of Environmentally Sensitive Areas within 2000m of the study site: **0**

Database searched and no data found.

Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site: **0**

Database searched and no data found.

Records of National Parks (NP) within 2000m of the study site: **0**

Database searched and no data found.

Records of Nitrate Sensitive Areas within 2000m of the study site: **0**

Database searched and no data found.

Records of Nitrate Vulnerable Zones within 2000m of the study site: **0**

Database searched and no data found.

Records of Ancient Woodland within 2000m of the study site: **0**

Database searched and no data found.

8. Natural Hazards Findings

8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a GroundSure GeoInsight, available from our website. The following information has been found:

8.1.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site? **Negligible**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

8.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? **Low**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property no significant increase in insurance risk due to natural slope instability problems.

8.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? **Null - Negligible**

Soluble rocks are not present in the search area. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

8.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? **Negligible**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? **Negligible**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

8.1.6Running Sand

What is the maximum Running Sand* hazard rating identified on the study site? **Low**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property no significant increase in insurance risk due to running sand problems is likely.

* This indicates an automatically generated 50m buffer and site.

9.Mining

9.1 Coal Mining

Are there any coal mining areas within 75m of the study site? **No**

Database searched and no data found.

9.2 Shallow Mining

What is the subsidence hazard relating to shallow mining on-site*? **Low**

*Please note this data is searched with a 150m buffer.

9.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? **No**

Guidance: No Guidance Required.

10.Contacts

CENTREMAPS

Telephone: 01886 832972
groundsure@centremaps.co.uk
CENTREMAPS, Brockamin House, Leigh, Worcester, London, WR6 5JU

Directors: M C Walker, MInst C.E.S., C M Walker, S J Hawkins BSc (Hons), S E Stewart BSc (Hons)
Registered No. 1890261 Registered in England and Wales
Registered Company: Laser Surveys Limited
Brockamin House, Leigh, Worcester, WR6 5JU.

British Geological Survey (England & Wales)

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3276. Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

Environment Agency

National Customer Contact Centre
PO Box 544
Rotherham
S60 1BY
Tel: 08708 506 506
Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk

Health Protection Agency

Chilton, Didcot, Oxon, OX11 0RQ
Tel: 01235 822622 www.hpa.org.uk/radiation
Radon measures and general radon information and guidance

The Coal Authority

200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848
DX 716176 Mansfield 5
Web: www.groundstability.com

Ordnance Survey

Romsey Road
Southampton SO16 4GU
Tel: 08456 050505

Local Authority

Authority: Neath Port Talbot County Borough Council
Phone: 01639 763333
Web: www.neath-porttalbot.gov.uk
Address: Port Talbot Civic Centre, Port Talbot, SA13 1PJ

Get Mapping PLC

Virginia Villas, High Street, Hartley Witney, Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements
This product includes map data licensed from Landmark Information Group Limited®.
© Crown Copyright 2003 and Landmark Information Group Limited® 2003. All Rights Reserved.

Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, English Nature who retain the Copyright and Intellectual Property Rights for the data.

PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].
This report has been prepared in accordance with the GroundSure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

1 Definitions

In these terms and conditions unless the context otherwise requires:

"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.

"Client" means the party or parties entering into a Contract with GroundSure.

"Commercial" means any building or property which is not Residential.

"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by GroundSure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

"Support Services" means Support Services provided by GroundSure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

"Contract" means the contract between GroundSure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

"Third Party Data Provider" means any third party providing Third Party Content to GroundSure.

"Data Reports" means reports comprising factual data with no accompanying interpretation.

"Fees" has the meaning set out in clause 5.1.

"GroundSure" means GroundSure Limited, a company registered in England and Wales under number 03421028.

"GroundSure Materials" means all materials prepared by GroundSure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.

"Order" means an electronic, written or other order form submitted by the Client requesting Services from GroundSure in respect of a specified Site.

"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

"Order Website" means the online platform through which Orders may be placed by the Client and accepted by GroundSure.

"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.

"Residential" means any building or property used as or intended to be used as a single dwelling.

"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by GroundSure.

"Services" means any Report, Mapping and/or Support Services which GroundSure has agreed to provide by accepting an Order pursuant to clause 2.6.

"Site" means the area of land in respect of which the Client has requested GroundSure to provide the Services.

"Third Party Content" means data, database information or other information which is provided to GroundSure by a Third Party Data Provider.

"User Guide" means the user guide, as amended from time to time, available upon request from GroundSure and on the website (www.groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 GroundSure agrees to provide the Services in accordance with the Contract.

2.2 GroundSure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of GroundSure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, GroundSure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and GroundSure will have no liability therefor. In addition you acknowledge and agree that GroundSure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 GroundSure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. GroundSure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by GroundSure. GroundSure's acceptance of an Order shall be binding only when made in writing and signed by GroundSure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1 The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to GroundSure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to GroundSure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as GroundSure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable GroundSure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the GroundSure Materials, or use the GroundSure Materials in a manner for which they were not intended. The Client may make the GroundSure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that GroundSure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1 The Client acknowledges that the Services provided by GroundSure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by GroundSure to be reliable.

4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;

(i) the Beneficiary,

(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),

(iv) the first purchaser or first tenant of the Site, and

(v) the professional advisers and lenders of the first purchaser or tenant of the Site.

4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by GroundSure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1 GroundSure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by GroundSure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").

5.2 The Client shall pay all outstanding Fees to GroundSure in full without deduction, counterclaim or set off within 30 days of the date of GroundSure's invoice or such other period as may be agreed in writing between GroundSure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.

5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of GroundSure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to

(i) full payment of all relevant Fees and

(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the GroundSure Materials.

6.2 All Intellectual Property in the GroundSure Materials are and shall remain owned by GroundSure or GroundSure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.

6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client shall, and shall procure that any recipients of the GroundSure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to GroundSure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the GroundSure Materials in order to advise the Beneficiary in a professional capacity. However, GroundSure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.

6.6 The Client shall procure that any person to whom the Services are made available shall notify GroundSure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of GroundSure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by GroundSure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.

7.4 GroundSure shall not be liable for

(i) loss of profits;

(ii) loss of business;

(iii) depletion of goodwill and/or similar losses;

(iv) loss of anticipated savings;

(v) loss of goods;

(vi) loss of contract;

(vii) loss of use;

(viii) loss or corruption of data or information;

(ix) business interruption;

(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;

(xi) loss or damage that arise as a result of the use of all or part of the GroundSure Materials in breach of the Contract;

(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the GroundSure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;

(xiii) loss or damage to a computer, software, modem, telephone or other property; and

(xiv) loss or damage caused by a delay or loss of use of GroundSure's internet ordering service.

7.5 GroundSure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.

7.6 GroundSure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of GroundSure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against GroundSure in relation to the Services or other matters arising pursuant to the Contract.

8 GroundSure's right to suspend or terminate

8.1 If GroundSure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, GroundSure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.
8.2 GroundSure shall be entitled to terminate the Contract immediately on written notice in the event that:
(i) the Client fails to pay any sum due to GroundSure within 30 days of the Payment Date; or
(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or
(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or
(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.
9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:
(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon GroundSure's acceptance of the Order; and
(ii) the Reports and/or Mapping provided under this Contract are
(a) supplied to the Client's specification(s) and in any event
(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:
(i) GroundSure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in GroundSure's possession or control; and
(ii) the Client shall pay to GroundSure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay GroundSure any additional costs incurred in relation to the termination or suspension of the Contract. 11 Anti-Bribery
11.1 The Client warrants that it shall:
(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;
(ii) comply with such of GroundSure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and
(iii) promptly report to GroundSure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.
11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.
12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through GroundSure.
12.3 GroundSure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of GroundSure.
12.4 No failure on the part of GroundSure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.
12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.
12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.
12.7 GroundSure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:
(i) the Client or Beneficiary's failure to provide facilities, access or information;
(ii) fire, storm, flood, tempest or epidemic;
(iii) Acts of God or the public enemy;
(iv) riot, civil commotion or war;
(v) strikes, labour disputes or industrial action;
(vi) acts or regulations of any governmental or other agency;
(vii) suspension or delay of services at public registries by Third Party Data Providers;
(viii) changes in law; or
(ix) any other reason beyond GroundSure's reasonable control.
In the event that GroundSure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then GroundSure shall be entitled to terminate this Contract immediately on written notice to the Client.
12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.
12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.
12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.
12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.
12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.
12.13 GroundSure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.
12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at GroundSure who will respond in a timely manner.
12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law.

© GroundSure Limited June 2013

centremapslive.com
the mapping portal from Laser Surveys

GroundSure
ENVIRONMENTAL INSIGHT

GroundSure GeoInsight

Address: ,

Date: 10 Sep 2013

Report Reference: CMAPS-CM-256601-18278-100913GEO

Your Reference: 18278

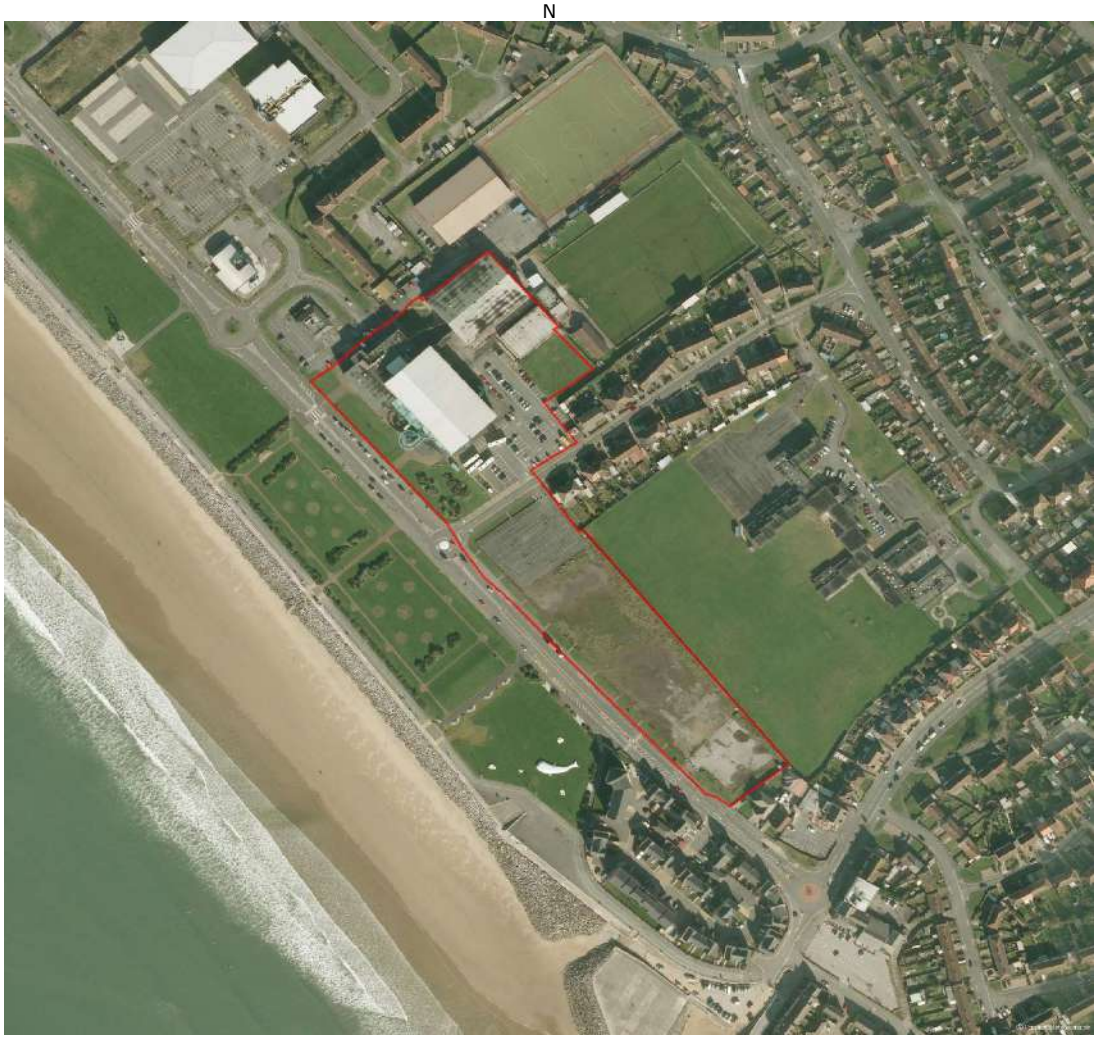


Brought to you by CENTREMAPS

If you would like any further assistance regarding this report then please contact
CENTREMAPS on (T) 01886 832972, (F) 01883 833485, email: groundsure@centremaps.co.uk

Aerial Photograph of Study Site

NW N NE



W E

SW S SE

Aerial photography supplied by Getmapping PLC.
© Copyright Getmapping PLC 2003. All Rights Reserved.

Site Name: ,
Grid Reference: 274711,189475
Size of Site: 3.10 ha

Overview of Findings

The GroundSure GeoInsight provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database, Johnson Poole and Bloomer mining data and GroundSure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary
1. Geology	**Description**
1.1 Artificial Ground,	
1.1.1 Is there any Artificial Ground /Made Ground present beneath the study site?*	No
1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	No
1.2 Superficial Geology & Landslips	
1.2.1 Is there any Superficial Ground/Drift Geology present beneath the study site?*	Yes
1.2.2 Are there any records relating to permeability of superficial geology within the study site* boundary?	Yes
1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
1.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No
1.3 Bedrock, Solid Geology & Faults	
1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
1.3.2 Are there any records relating to permeability of bedrock within the study site* boundary?	Yes
1.3.3 Are there any records of faults within 500m of the study site boundary?	Yes
1.3.4 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level
1.3.5 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary

* This includes an automatically generated 50m buffer zone around the site

Source:Scale 1:50,000 BGS Sheet No:247

2. Ground Workings	on-site	0-50	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	0	0	10	-	-
2.2 Historical Underground Workings Features from Small Scale Mapping	0	0	0	0	0
2.3 Current Ground Workings	0	0	0	0	0

3. Mining, Extraction & Natural Cavities	on-site	0-50	51-250	251-500	501-1000
3.1 Historical Mining	0	0	0	0	3
3.2 Coal Mining	0	0	0	1	0
3.3 Johnson Poole and Bloomer Mining Area	0	0	0	0	0
3.4 Non-Coal Mining*	0	0	0	0	0
3.5 Non–Coal Mining Cavities	0	0	0	0	0
3.6 Natural Cavities	0	0	0	0	0
3.7 Brine Extraction	0	0	0	0	0
3.8 Gypsum Extraction	0	0	0	0	0
3.9 Tin Mining	0	0	0	0	0
3.10 Clay Mining	0	0	0	0	0

*This includes an automatically generated 50m buffer zone around the site

4. Natural Ground Subsidence	on-site*	0-50	51-250	251-500	501-1000
4.1 Shrink-Swell Clay	Negligible	-	-	-	-
4.2 Landslides	Low	-	-	-	-
4.3 Ground Dissolution of Soluble Rocks	Null	-	-	-	-
4.4 Compressible Deposits	Negligible	-	-	-	-
4.5 Collapsible Deposits	Negligible	-	-	-	-
4.6 Running Sand	Low	-	-	-	-

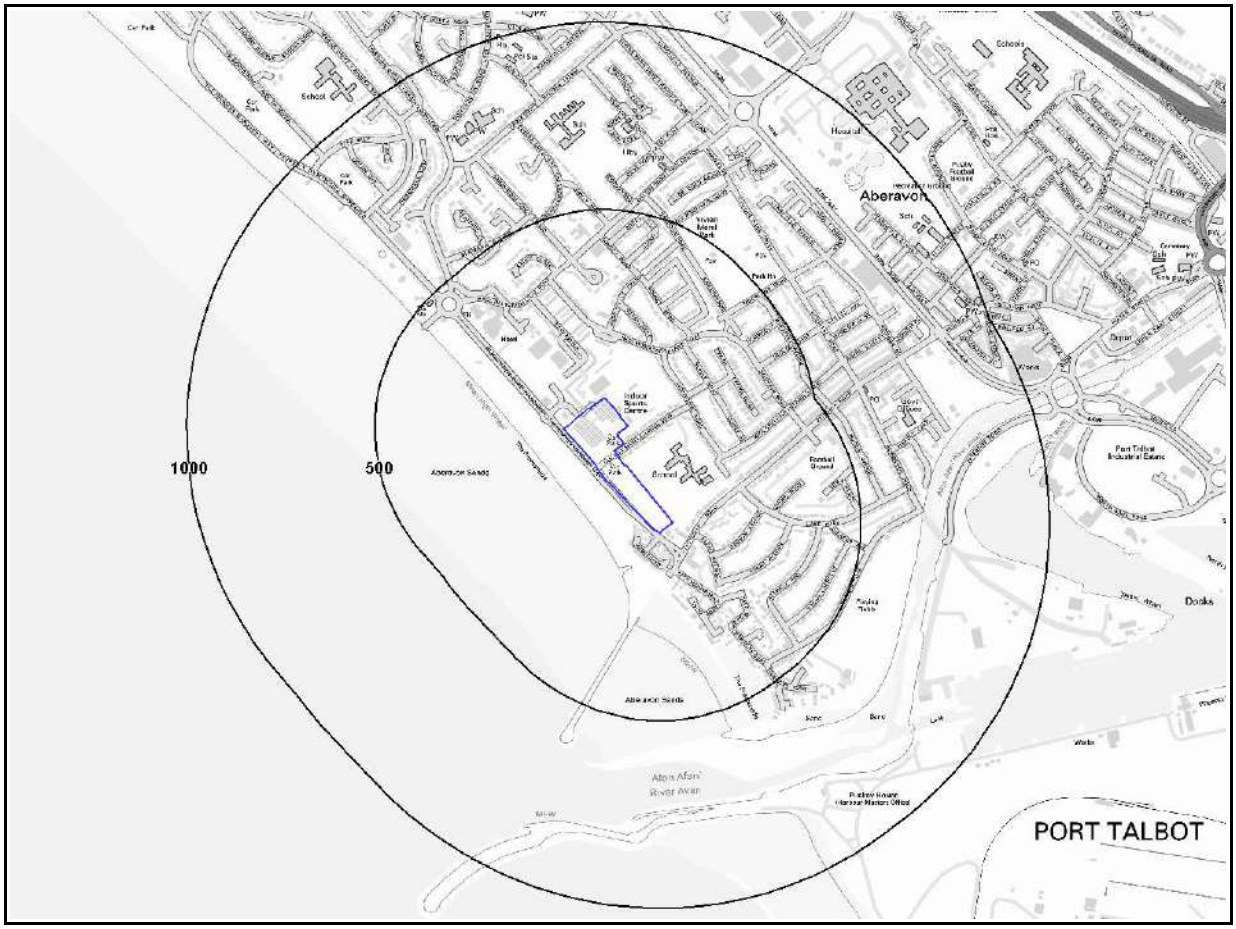
* This includes an automatically generated 50m buffer zone around the site

5. Borehole Records	on-site	0-50	51-250	251-500	501-1000
5.1 BGS Recorded Boreholes	1	1	4	-	-

6. Estimated Background Soil Chemistry	on-site	0-50	51-250	251-500	501-1000
6.1 Records of Background Soil Chemistry	1	0	0	-	-

1.1 Artificial Ground Map

NW N NE



W E

SW S SE

Artificial Ground Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

500
1000
Search Buffers (m)

Made Ground (undivided)

Disturbed Ground (undivided)

Worked Ground (undivided)

Landscaped Ground (undivided)

Infilled Ground

Reclaimed Ground

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:247

1.1.1 Artificial/Made Ground

Are there any records of Artificial/Made Ground within 500m of the study site boundary? **No**

Database searched and no data found.

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site* boundary? **No**

Database searched and no data found.

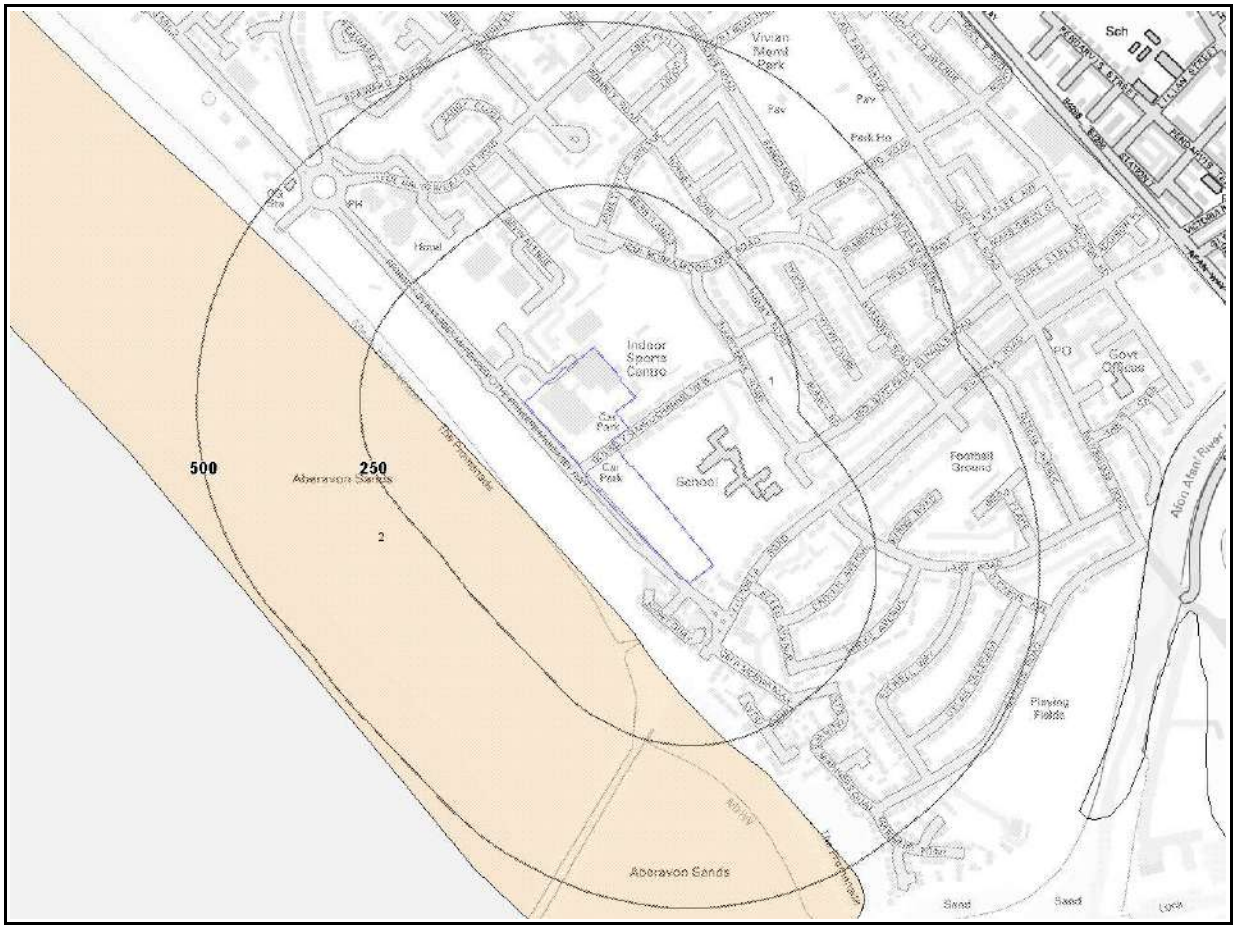
* This includes an automatically generated 50m buffer zone around the site.

1.2 Superficial Deposits and Landslips Map

NW N NE

W E

SW S SE



Superficial and Landslips Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

500
1000
Search Buffers (m)

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/Drift Geology

Are there any records of Superficial Deposits/Drift Geology within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	Lex Code	Description	Rock Description
1	0.0	On Site	BSA-SAND	BLOWN SAND	SAND
2	101.0	SW	BTFU-CLSS	BEACH AND TIDAL FLAT DEPOSITS (UNDIFFERENTIATED)	CLAY, SILT AND SAND

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site* boundary? Yes

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	High	High

1.2.3 Landslip

Are there any records of Landslip within 500m of the study site boundary? No

Database searched and no data found.

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

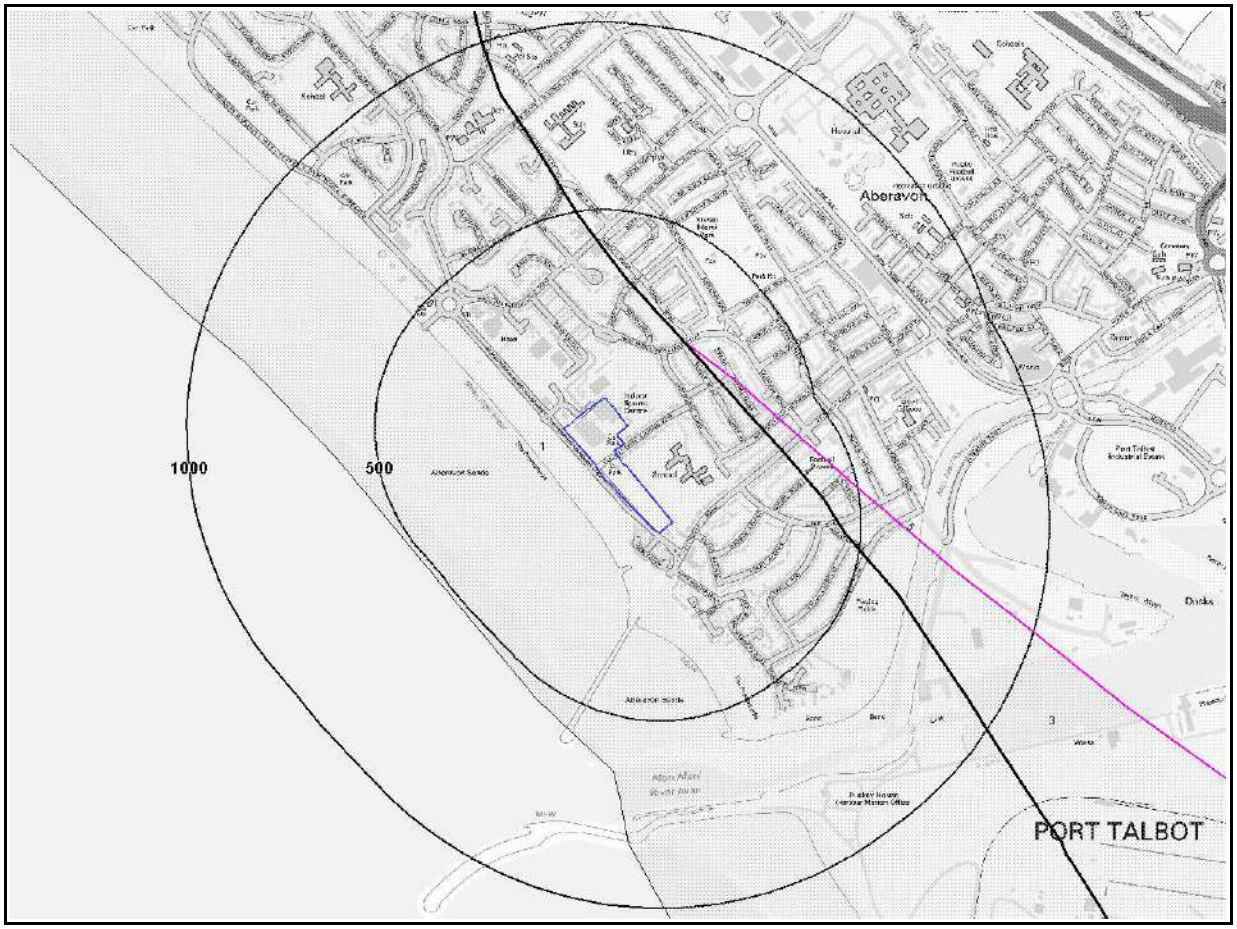
Are there any records relating to permeability of landslips within the study site* boundary? No

Database searched and no data found.

*This includes an automatically generated 50m buffer zone around the site.

1.3 Bedrock and Faults Map

NW N NE



W E

SW S SE

Bedrock & Faults Deposits Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

500
1000
Search Buffers (m)

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:247

1.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	SWMCM-MDSS	South Wales Middle Coal Measures Formation - Mudstone, Siltstone And Sandstone	Bolsovian (westphalian C) / Duckmantian (westphalian B)
2	256.0	NE	LLFB-MDSS	Llynfi Member - Mudstone, Siltstone And Sandstone	Bolsovian (westphalian C)
3	257.0	NE	SWMCM-MDSS	South Wales Middle Coal Measures Formation - Mudstone, Siltstone And Sandstone	Bolsovian (westphalian C) / Duckmantian (westphalian B)

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary? Yes

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Moderate	Low

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	Category Description	Feature Description
4	256.0	NE	FAULT	Normal fault, inferred
5	257.0	NE	FOSSIL_HORIZON	Fossil horizon, marine band

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3.4 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

The property is in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level

1.3.5 Radon Protection

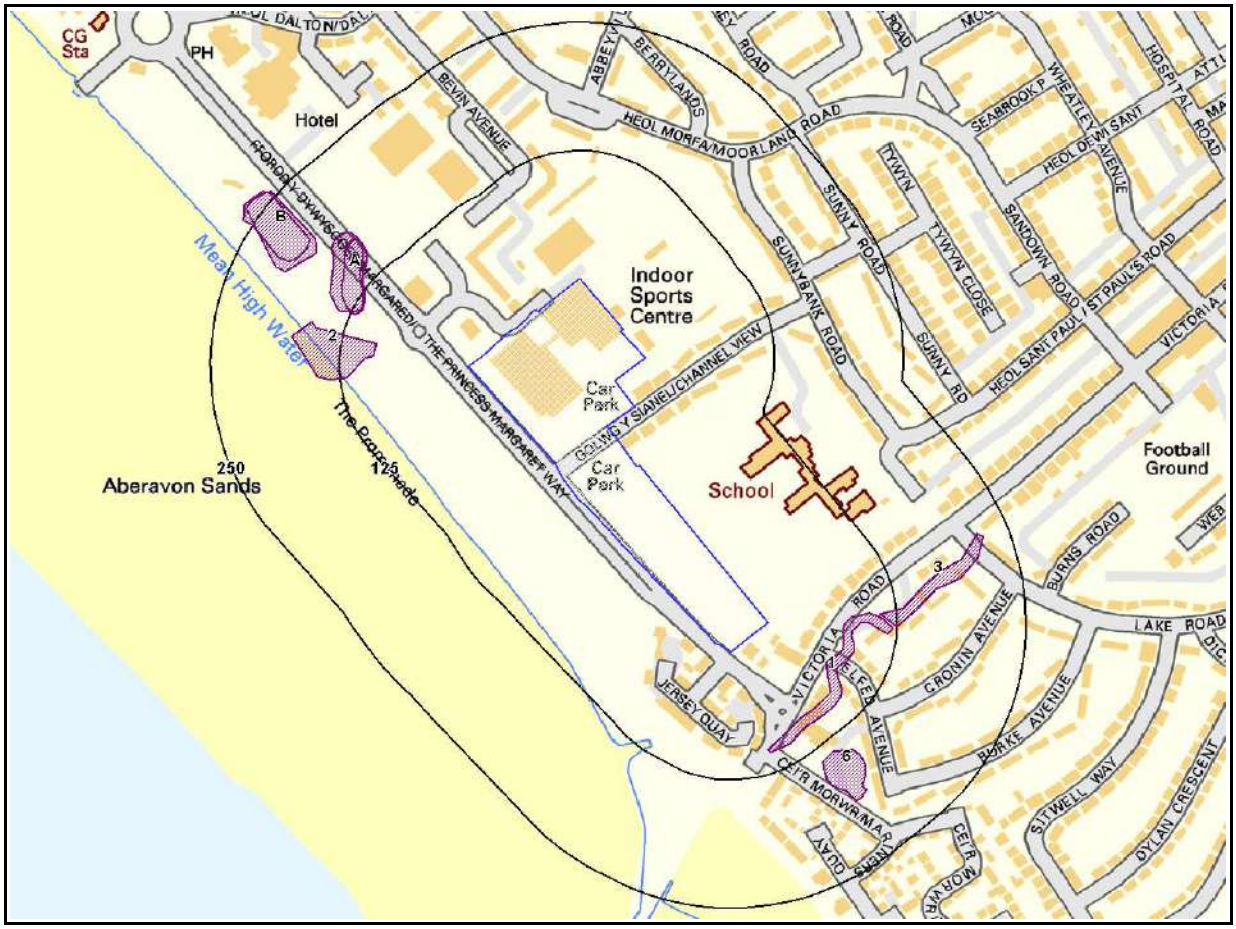
* This includes an automatically generated 50m buffer zone around the site.

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?

No radon protective measures are necessary

2. Ground Workings Map

NW N NE



W E

SW S SE

Ground Workings Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

125
250
Search Buffers (m)

Historic Surface Ground Workings

Historic Underground Workings

Current Ground Workings

2. Ground Workings

2.1 Historical Surface Ground Working Features derived from Historical Mapping

This dataset is based on GroundSure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
1	68.0	SE	274917,189263	Unspecified Ground Workings	1897
2	91.0	W	274411,189584	Unspecified Heap	1947
3	109.0	E	275016,189363	Unspecified Ground Workings	1947
4A	116.0	NW	274456,189659	Unspecified Heap	1947
5A	118.0	NW	274448,189663	Unspecified Heap	1897
6	138.0	SE	274931,189174	Sand Pit	1947
7B	183.0	NW	274385,189703	Unspecified Pit	1978
8B	193.0	NW	274380,189708	Unspecified Pit	1965
9B	193.0	NW	274380,189708	Unspecified Pit	1991
10 B	193.0	NW	274380,189708	Unspecified Pit	1979

2.2 Historical Underground Workings Features derived from Historical Mapping

This data is derived from the GroundSure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? No

Database searched and no data found.

2.3 Current Ground Workings

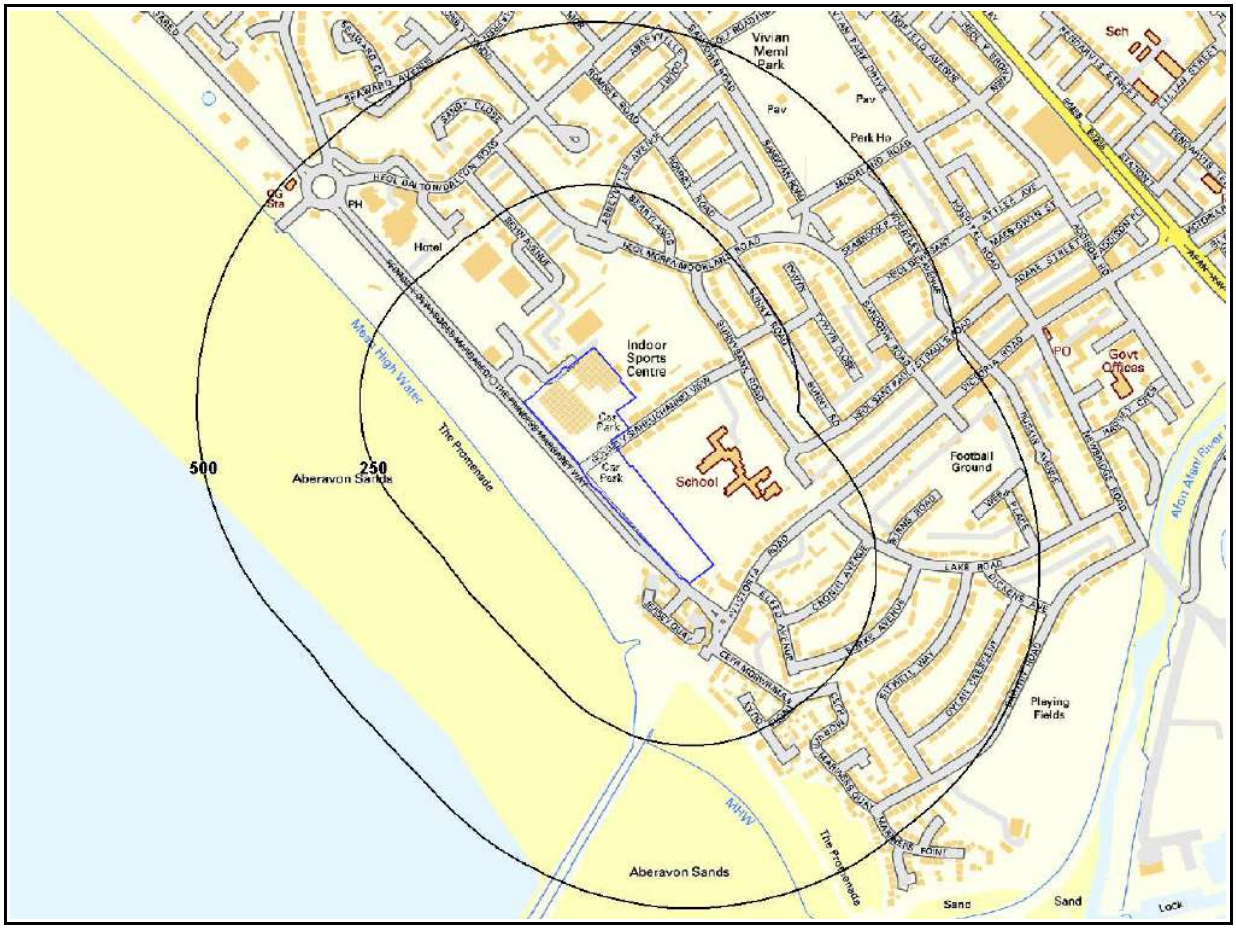
This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? No

Database searched and no data found.

3. Mining, Extraction & Natural Cavities Map

NW N NE



W E

SW S SE

Mining, Extraction & Natural Cavities Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

250
500
Search Buffers (m)

Historical Mining

Non-Coal Mining Cavities

Natural Cavities

Non-Coal Mining

Highly likely

Likely

Unlikely

Highly unlikely

Rare

3.Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from GroundSure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? **Yes**

The following Historical Mining information is provided by Groundsure :

ID	Distance (m)	Direction	NGR	Details	Date
Not shown	969.0	E	275765,188 947	Coal Tip	1914
Not shown	969.0	E	275765,188 947	Coal Tip	1921
Not shown	973.0	SE	275766,188 940	Coal Tip	1875

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? **Yes**

The following Coal Mining information provided by the Coal Authority is not represented on Mapping:

Distance (m)	Direction	Details
343.0	N	The study site is located within the specified search distance of an identified mining area. Further details concerning this can be obtained from the Coal Authority Helpline on 0845 762 6848.

3.3 Johnson Poole and Bloomer

This dataset provides information as to whether the study site lies within an area where JPB hold information relating to mining.

Are there any JPB Mining areas within 1000m of the study site boundary? **No**

The following information provided by JPB is not represented on Mapping:

Database searched. No results found.

3.4 Non – Coal Mining

This dataset provides information as to whether the study site lies within an area which may have been subject to non-coal historic mining.

Are there any Non-Coal Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.5 Non – Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.7 Brine Extraction

This dataset provides information from the Brine Compensation Board which has been discontinued and is now covered by the Coal Authority.

Are there any Brine Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level. More detailed information on potential Tin Mining may be found in Section 3.4 – Non-Coal Mining Hazards.

Are there any Tin Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.10 Clay Mining

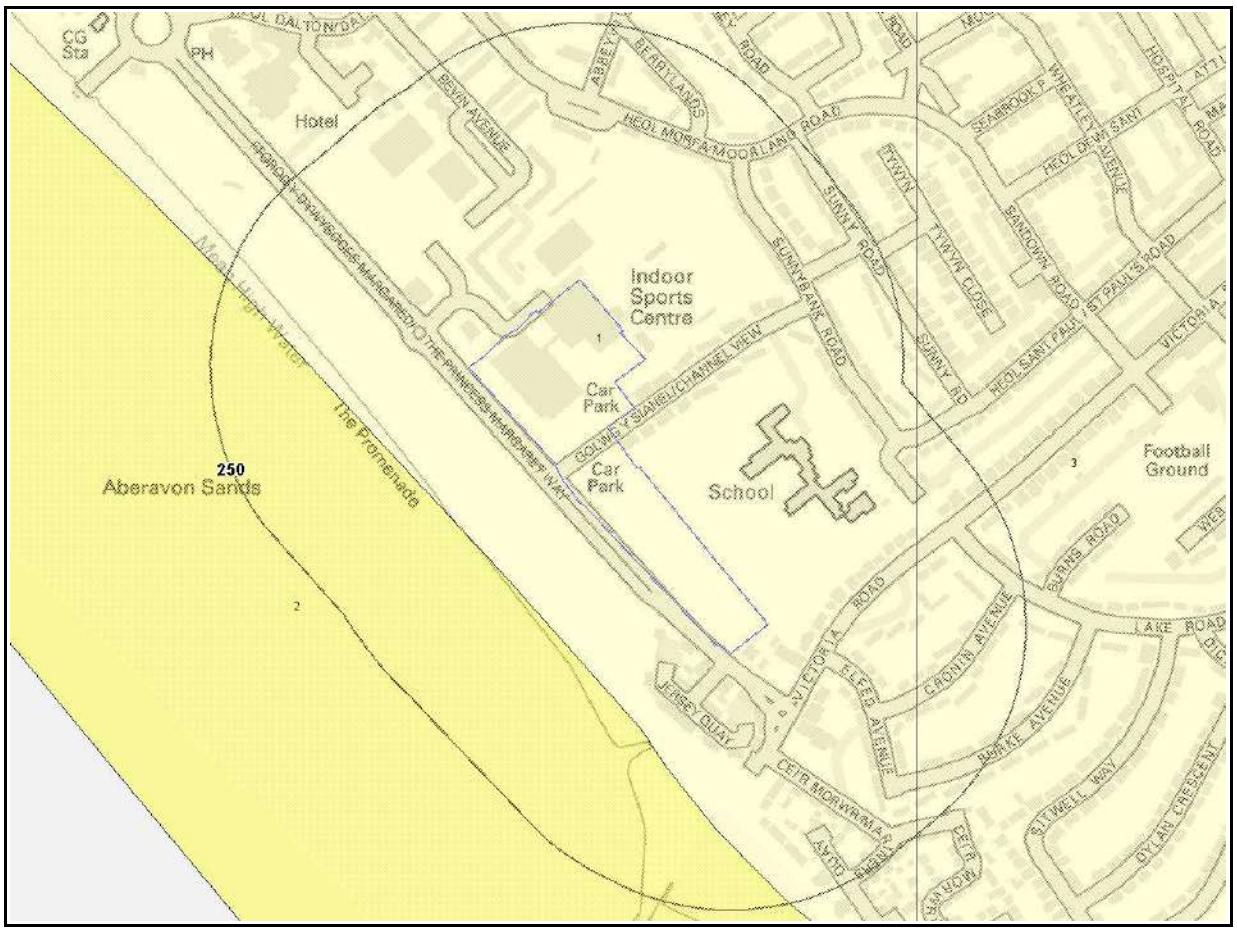
This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

4. Natural Ground Subsidence
4.1 Shrink-Swell Clay Map

NW N NE



W E

SW S SE

Shrink-Swell Clay Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

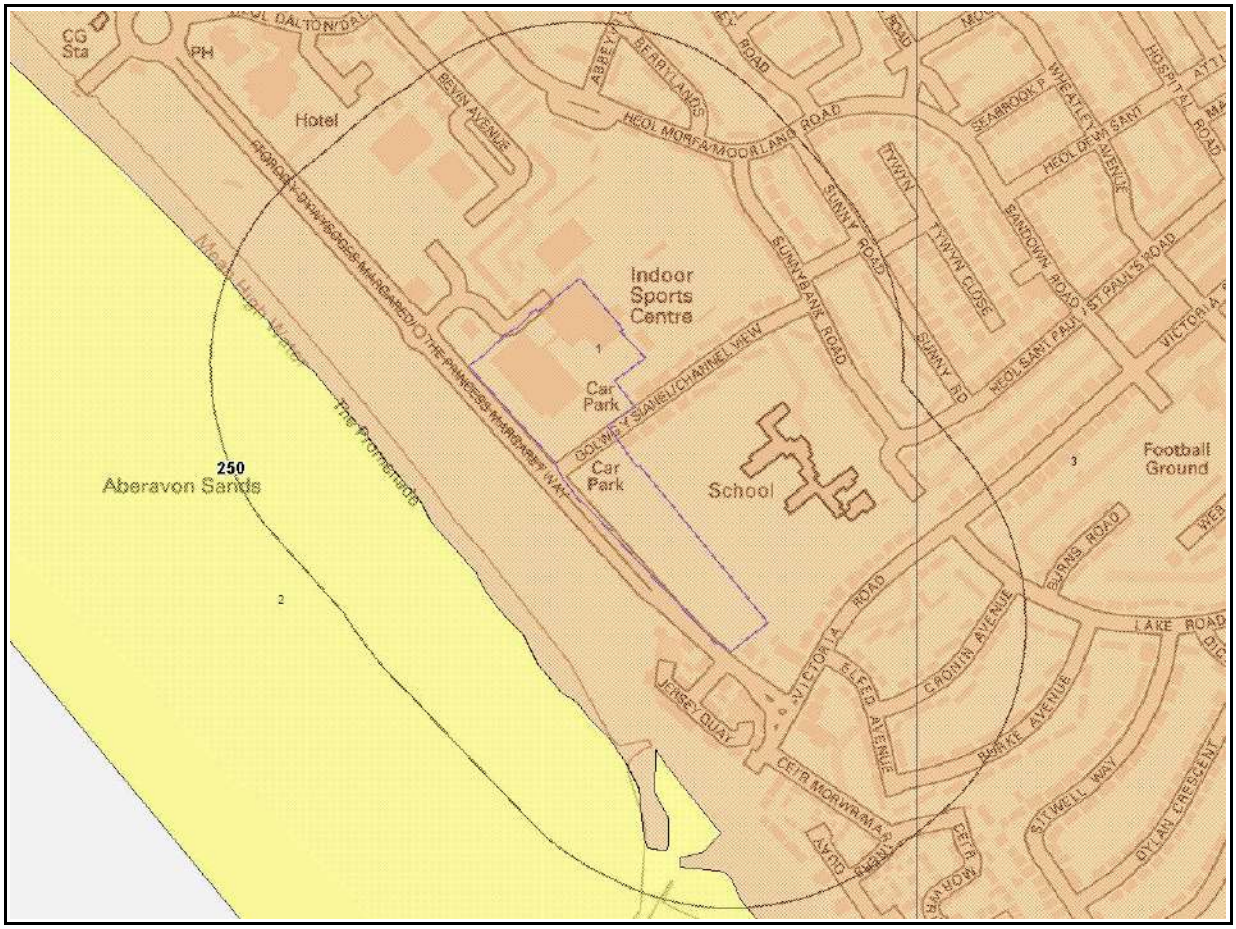
125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.2 Landslides Map

NW N NE



W E

SW S SE

Landslides Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

Very Low

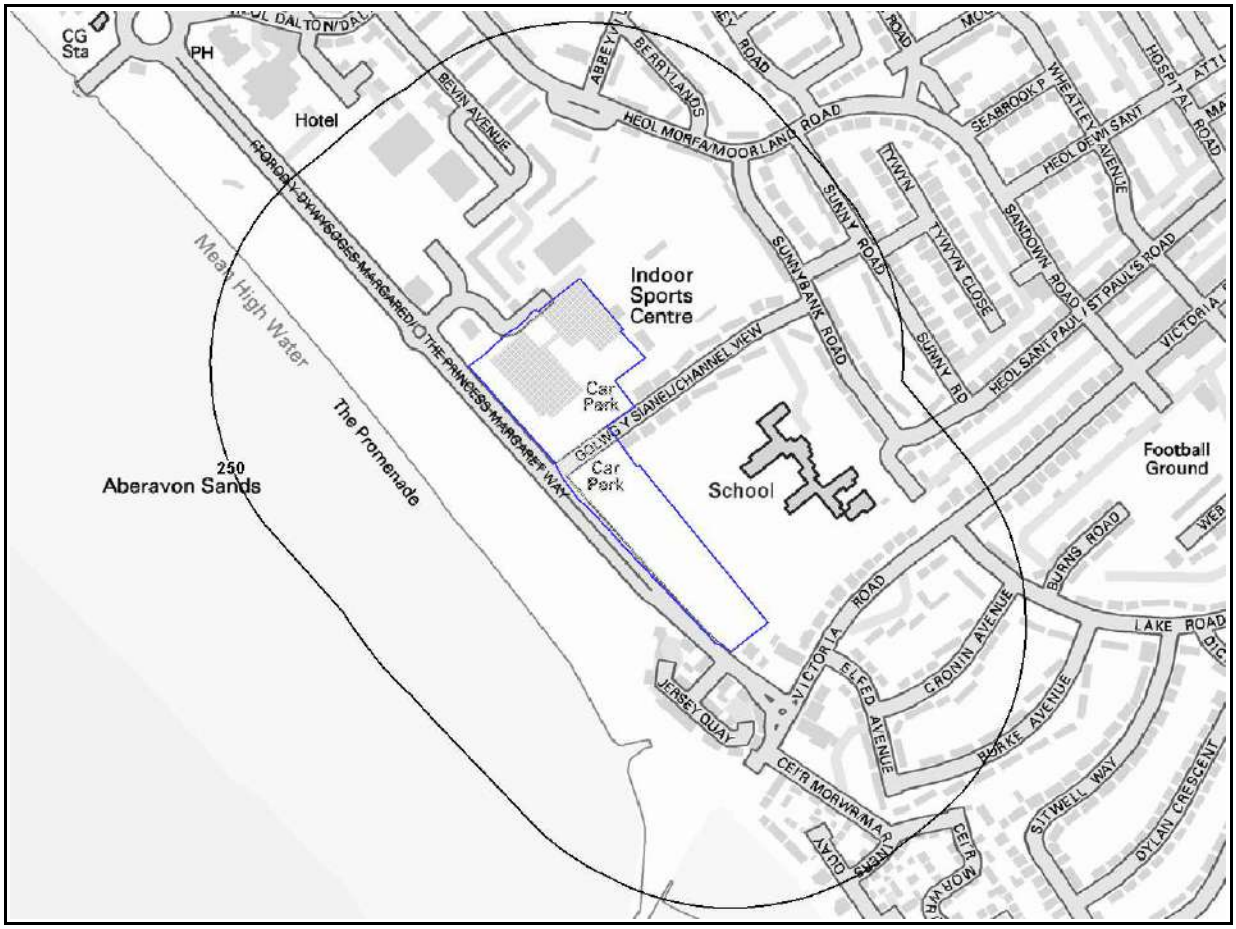
Low

Moderate

High

4.3 Ground Dissolution Soluble Rocks Map

NW N NE



W E

SW S SE

Ground Dissolution Soluble Rocks Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

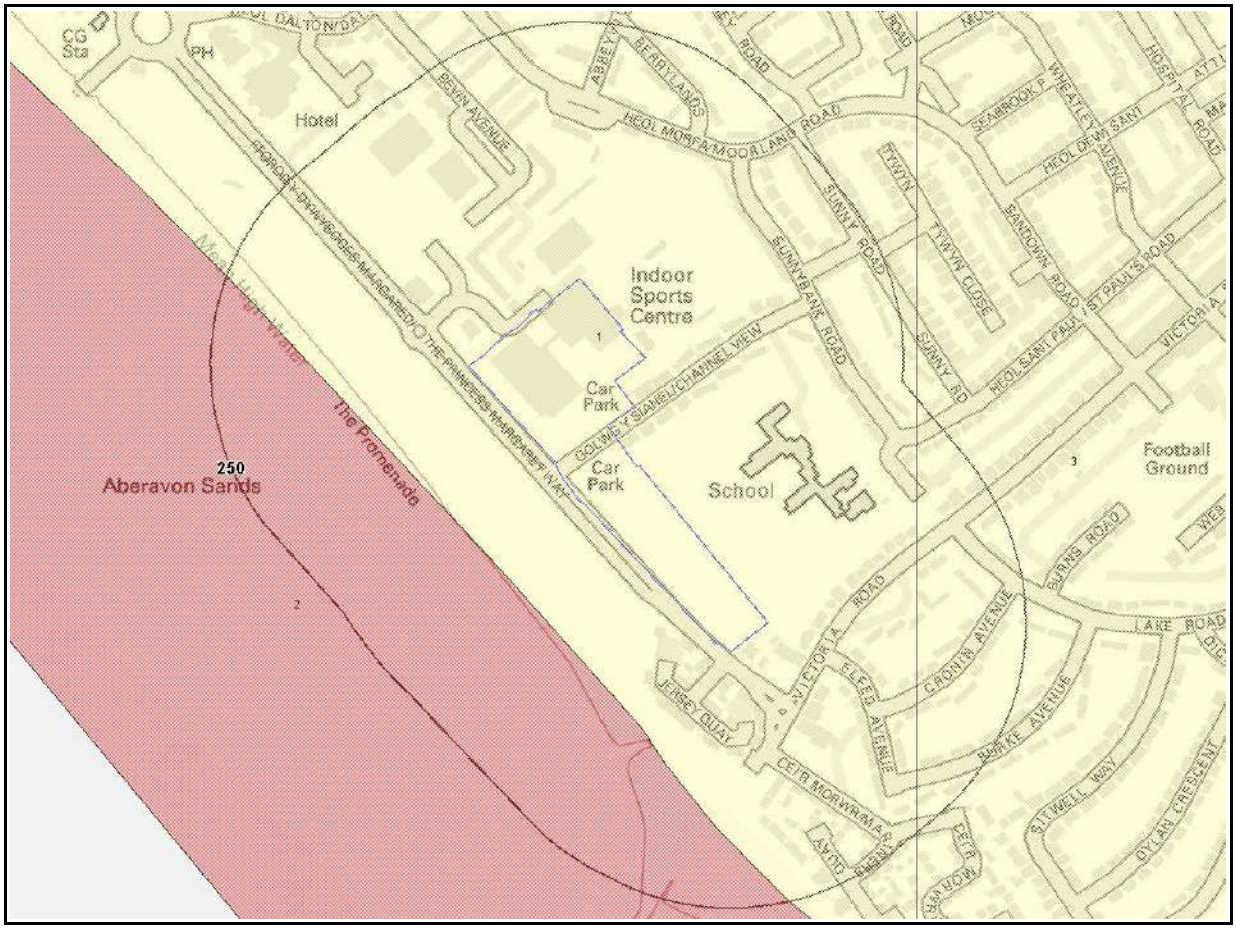
125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.4 Compressible Deposits Map

NW N NE



W E

SW S SE

Compressible Deposits Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

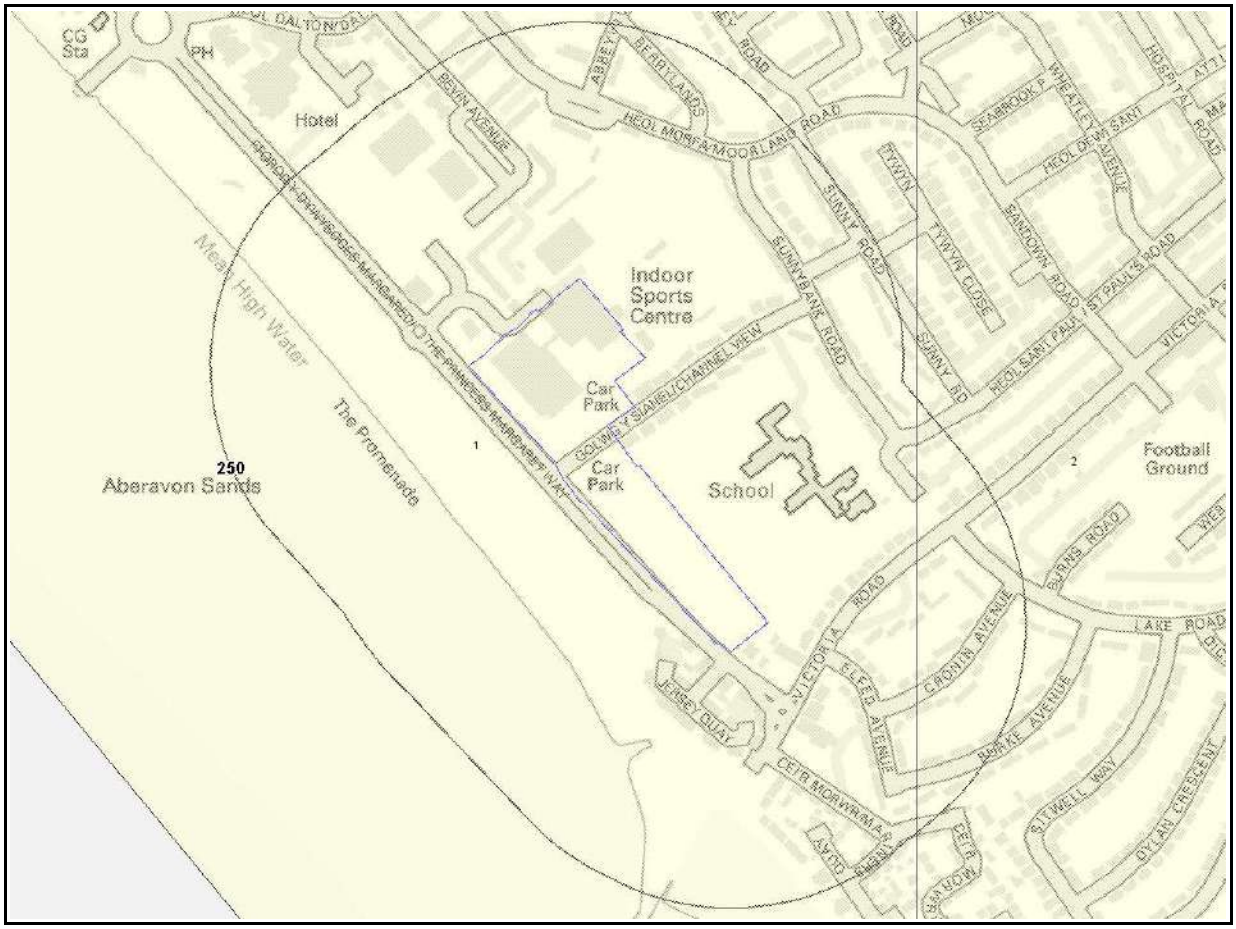
125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.5 Collapsible Deposits Map

NW N NE



W E

SW S SE

Collapsible Deposits Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

125
250
Search Buffers (m)

No Data / Null

Negligible

Very Low

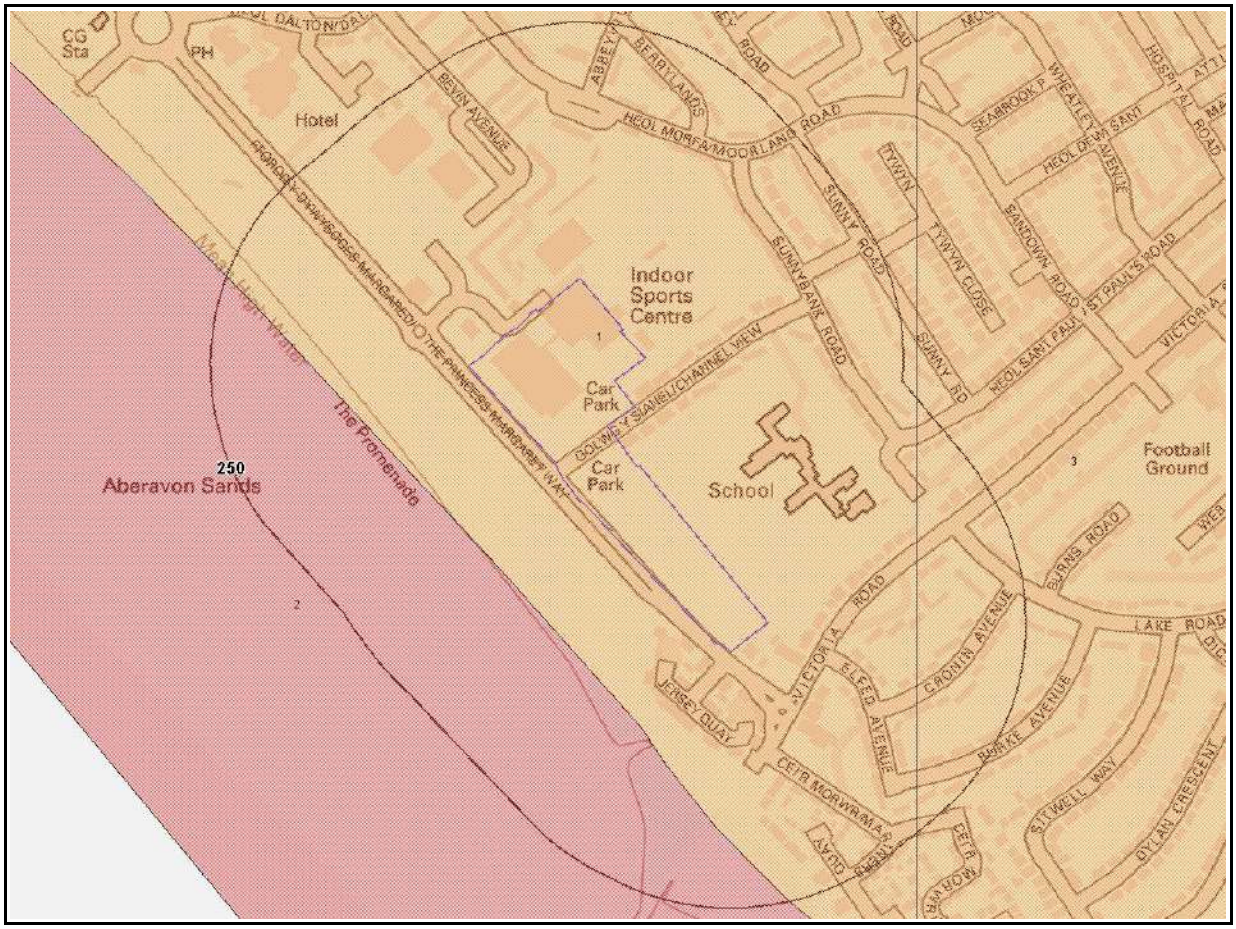
Low

Moderate

High

4.6 Running Sand Map

NW N NE



W E

SW S SE

Running Sand Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

125
250
Search Buffers (m)

No Data / Null
Negligible
Very Low

Low
Moderate
High

4.Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS).

The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site* boundary? Low

4.1 Shrink – Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m) *	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	Ground conditions predominantly non-plastic. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely likely due to potential problems with shrink-swell clays.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Possibility of slope instability problems after major changes in ground conditions. Consideration should be given to stability if changes to drainage or excavations take place. Possible increase in construction cost to reduce potential slope stability problems. Existing property no significant increase in insurance risk due to natural slope instability problems.

4.3 Ground Dissolution of Soluble Rocks

The following Soluble Rocks information provided by the British Geological Survey:

Distance (m)*	Direction	Hazard Rating	Details
0.0	On site	Null-Negligible	Soluble rocks are not present in the search area. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

4.4 Compressible Deposits

The following Compressible Ground information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details

*This includes an automatically generated 50m buffer zone around the study site boundary.

1	0.0	On Site	Negligible	No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

4.5 Collapsible Deposits

The following Collapsible Rocks information is provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Negligible	No indicators for collapsible deposits identified. No actions required to avoid problems due to collapsible deposits. No special ground investigation required, or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

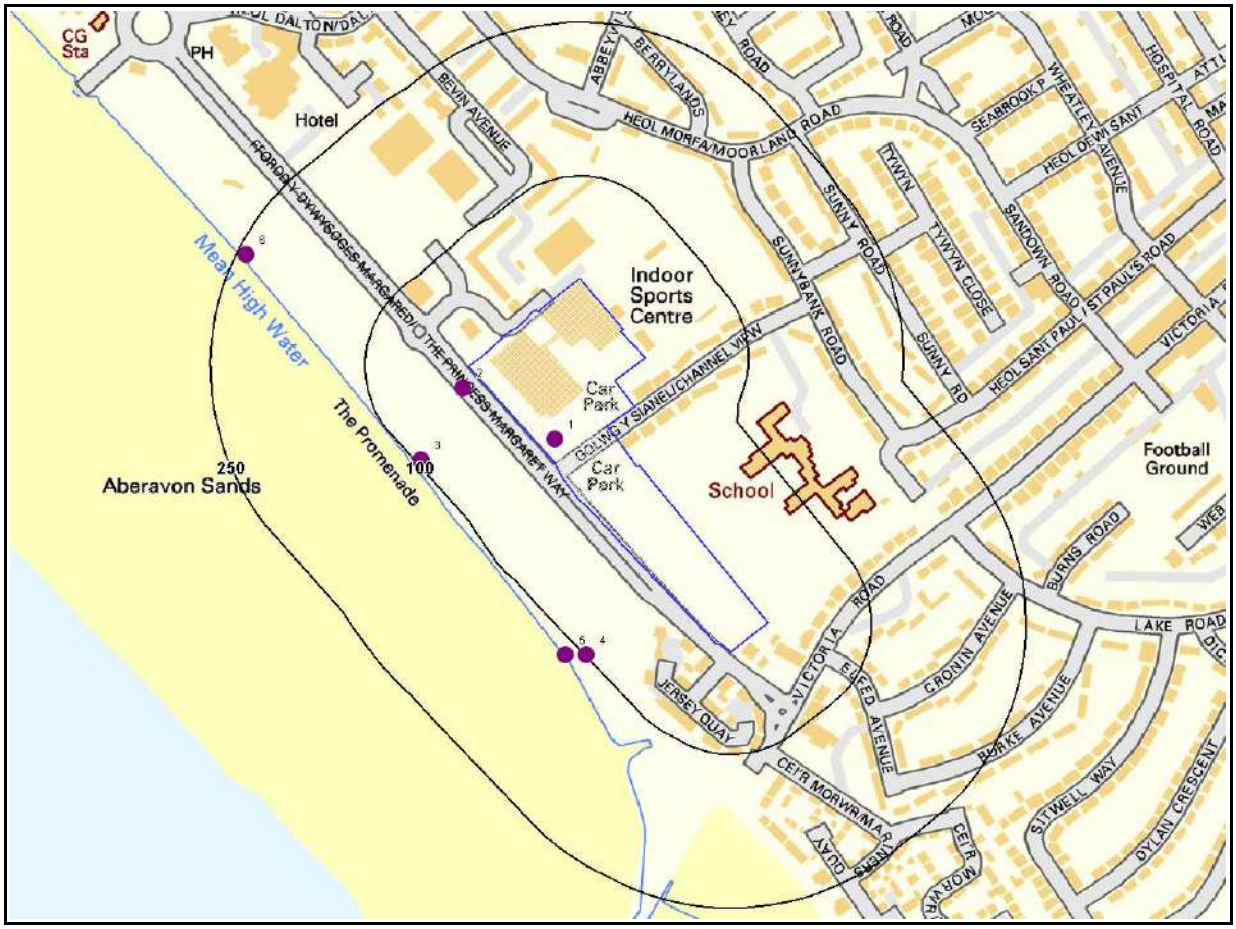
4.6 Running Sands

The following Running Sands information is provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Low	Possibility of running sand problems after major changes in ground conditions. Normal maintenance to avoid leakage of water-bearing services or water bodies (ponds, swimming pools) should reduce likelihood of problems due to running sand. For new build consider possibility of running sand into trenches or excavations if water table is high or sandy strata are exposed to water. Avoid concentrated water inputs to site. Unlikely to be an increase in construction costs due to potential for running sand. For existing property no significant increase in insurance risk due to running sand problems is likely.

5. Borehole Records Map

NW N NE



W E

SW S SE

Borehole Records Legend

Mapping sourced from Ordnance Survey

© Crown copyright and database rights 2013. Ordnance Survey license 100035207.

Site Outline

Borehole Locations

125
250
Search Buffers (m)

5.Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: 6

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length (m)	Borehole Name
1	0.0	On Site	274650,189500	SS78NW9	405.33	ABERAVON, NO 3
2	19.0	SW	274560,189550	SS78NW4	408.0	ABERAVON MARSHES 3
3	96.0	SW	274520,189480	SS78NW6	12.49	ABERAVON PROMENADE EXTENSION 2
4	100.0	SW	274680,189290	SS78NW5	15.39	ABERAVON PROMENADE EXTENSION 1
5	114.0	SW	274660,189290	SS78NW8	429.76	ABERAVON BURROWS METROPOLITAN WATER BOARD NO 1
6	241.0	NW	274350,189680	SS78NW7	12.19	ABERAVON PROMENADE EXTENSION 3

Additional online information is available for the following boreholes listed above:

#1: http://scans.bgs.ac.uk/sobi_scans/boreholes/370933
#2: http://scans.bgs.ac.uk/sobi_scans/boreholes/370928
#3: http://scans.bgs.ac.uk/sobi_scans/boreholes/370930
#4: http://scans.bgs.ac.uk/sobi_scans/boreholes/370929
#5: http://scans.bgs.ac.uk/sobi_scans/boreholes/370932
#6: http://scans.bgs.ac.uk/sobi_scans/boreholes/370931

6.Estimated Background Soil Chemistry

Records of background estimated soil chemistry within 250m of the study site boundary: 1

For further information on how this data is calculated and limitations upon its use, please see the GroundSure GeoInsight User Guide, available on request.

			Estimated Geometric Mean Soil Concentrations (mg/kg)				
Distance (m)*	Direction	Sample Type	Arsenic (As)	Cadmium (Cd)	Chromium (Cr)	Nickel (Ni)	Lead (Pb)
0.0	On Site	Sediment	35 - 45 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<150 mg/kg

*As this data is based upon underlying 1:50,000 scale geological information, a 50m buffer has been added to the search radius.

7. Contacts

CENTREMAPS

Telephone: 01886 832972
groundsure@centremaps.co.uk
CENTREMAPS, Brockamin House, Leigh, Worcester, London, WR6 5JU

Directors: M C Walker, MInst C.E.S., C M Walker, S J Hawkins BSc (Hons), S E Stewart BSc (Hons)
Registered No. 1890261 Registered in England and Wales
Registered Company: Laser Surveys Limited
Brockamin House, Leigh, Worcester, WR6 5JU.

British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

British Gypsum

British Gypsum Ltd, East Leake, Loughborough, Leicestershire, LE12 6HX
Tel: www.british-gypsum.com

The Coal Authority

200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848
DX 716176 Mansfield 5 www.coal.gov.uk

Johnson Poole & Bloomer Limited

Harris and Pearson Building, Brettel Lane, Brierley Hill, West Midlands DY5 3LH
Tel: +44 (0) 1384 262 000
Email: enquiries.gs@jpb.co.uk
Website: www.jpb.co.uk

Ordnance Survey

Romsey Road, Southampton SO16 4GU
Tel: 08456 050505

Getmapping PLC

Virginia Villas, High Street, Hartley Witney,
Hampshire RG27 8NW
Tel: 01252 845444

Peter Brett Associates

Caversham Bridge House, Waterman Place, Reading
Berkshire RG1 8DN
Tel: +44 (0)118 950 0761 E-mail: reading@pba.co.uk

Acknowledgements

PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].

This report has been prepared in accordance with the GroundSure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

1 Definitions

In these terms and conditions unless the context otherwise requires:

"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.

"Client" means the party or parties entering into a Contract with GroundSure.

"Commercial" means any building or property which is not Residential.

"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by GroundSure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

"Support Services" means Support Services provided by GroundSure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

"Contract" means the contract between GroundSure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

"Third Party Data Provider" means any third party providing Third Party Content to GroundSure.

"Data Reports" means reports comprising factual data with no accompanying interpretation.

"Fees" has the meaning set out in clause 5.1.

"GroundSure" means GroundSure Limited, a company registered in England and Wales under number 03421028.

"GroundSure Materials" means all materials prepared by GroundSure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.

"Order" means an electronic, written or other order form submitted by the Client requesting Services from GroundSure in respect of a specified Site.

"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

"Order Website" means the online platform through which Orders may be placed by the Client and accepted by GroundSure.

"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.

"Residential" means any building or property used as or intended to be used as a single dwelling.

"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by GroundSure.

"Services" means any Report, Mapping and/or Support Services which GroundSure has agreed to provide by accepting an Order pursuant to clause 2.6.

"Site" means the area of land in respect of which the Client has requested GroundSure to provide the Services.

"Third Party Content" means data, database information or other information which is provided to GroundSure by a Third Party Data Provider.

"User Guide" means the user guide, as amended from time to time, available upon request from GroundSure and on the website (www.groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 GroundSure agrees to provide the Services in accordance with the Contract.

2.2 GroundSure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of GroundSure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, GroundSure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and GroundSure will have no liability therefor. In addition you acknowledge and agree that GroundSure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 GroundSure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. GroundSure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by GroundSure. GroundSure's acceptance of an Order shall be binding only when made in writing and signed by GroundSure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1 The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to GroundSure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to GroundSure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as GroundSure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable GroundSure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the GroundSure Materials, or use the GroundSure Materials in a manner for which they were not intended. The Client may make the GroundSure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that GroundSure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1The Client acknowledges that the Services provided by GroundSure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by GroundSure to be reliable.
4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;
(i) the Beneficiary,
(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),
(iv) the first purchaser or first tenant of the Site, and
(v) the professional advisers and lenders of the first purchaser or tenant of the Site.
4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.
4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by GroundSure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1GroundSure shall charge and the Client shall pay fees at the rate and frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by GroundSure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").
5.2 The Client shall pay all outstanding Fees to GroundSure in full without deduction, counterclaim or set off within 30 days of the date of GroundSure's invoice or such other period as may be agreed in writing between GroundSure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.
5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of GroundSure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to
(i) full payment of all relevant Fees and
(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the GroundSure Materials.
6.2 All Intellectual Property in the GroundSure Materials are and shall remain owned by GroundSure or GroundSure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.
6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.
6.4 The Client shall, and shall procure that any recipients of the GroundSure Materials shall:
(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to GroundSure or any third party from the Services;
(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;
(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);
(iv) not combine the Services with or incorporate such Services into any other information data or service;
(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);
(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and
(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,
6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the GroundSure Materials in order to advise the Beneficiary in a professional capacity. However, GroundSure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.
6.6 The Client shall procure that any person to whom the Services are made available shall notify GroundSure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of GroundSure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:
(i) any breach of contract, including any deliberate breach of the Contract by GroundSure or its employees, agents or subcontractors;
(ii) any use made of the Reports, Services, Materials or any part of them; and
(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.
7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.
7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.
7.4 GroundSure shall not be liable for
(i) loss of profits;
(ii) loss of business;
(iii) depletion of goodwill and/or similar losses;
(iv) loss of anticipated savings;
(v) loss of goods;
(vi) loss of contract;
(vii) loss of use;
(viii) loss or corruption of data or information;
(ix) business interruption;
(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;
(xi) loss or damage that arise as a result of the use of all or part of the GroundSure Materials in breach of the Contract;
(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the GroundSure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;
(xiii) loss or damage to a computer, software, modem, telephone or other property; and
(xiv) loss or damage caused by a delay or loss of use of GroundSure's internet ordering service.
7.5 GroundSure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.
7.6 GroundSure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of GroundSure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against GroundSure in relation to the Services or other matters arising pursuant to the Contract.

8 GroundSure's right to suspend or terminate

8.1 If GroundSure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, GroundSure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.
8.2 GroundSure shall be entitled to terminate the Contract immediately on written notice in the event that:
(i) the Client fails to pay any sum due to GroundSure within 30 days of the Payment Date; or
(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or
(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or
(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.
9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:
(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon GroundSure's acceptance of the Order; and
(ii) the Reports and/or Mapping provided under this Contract are
(a) supplied to the Client's specification(s) and in any event
(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:
(i) GroundSure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in GroundSure's possession or control; and
(ii) the Client shall pay to GroundSure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay GroundSure any additional costs incurred in relation to the termination or suspension of the Contract. 11 Anti-Bribery
11.1 The Client warrants that it shall:
(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;
(ii) comply with such of GroundSure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and
(iii) promptly report to GroundSure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.
11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.
12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through GroundSure.
12.3 GroundSure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of GroundSure.
12.4 No failure on the part of GroundSure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.
12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.
12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.
12.7 GroundSure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:
(i) the Client or Beneficiary's failure to provide facilities, access or information;
(ii) fire, storm, flood, tempest or epidemic;
(iii) Acts of God or the public enemy;
(iv) riot, civil commotion or war;
(v) strikes, labour disputes or industrial action;
(vi) acts or regulations of any governmental or other agency;
(vii) suspension or delay of services at public registries by Third Party Data Providers;
(viii) changes in law; or
(ix) any other reason beyond GroundSure's reasonable control.
In the event that GroundSure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then GroundSure shall be entitled to terminate this Contract immediately on written notice to the Client.
12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.
12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.
12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.
12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.
12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.
12.13 GroundSure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.
12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at GroundSure who will respond in a timely manner.
12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law.

© GroundSure Limited June 2013

ANNEX B

Hyder Ground Investigation Report

Neath Port Talbot Borough Council

Afan Lido

Ground Investigation Report



Hyder Consulting (UK) Limited
2212959
5th Floor
The Pithay
All Saints Street
Bristol BS1 2NL
United Kingdom
Tel: +44 (0)117 372 1200
Fax: +44 (0)117 37
www.hyderconsulting.com

Neath Port Talbot Borough Council

Afan Lido

Ground Investigation Report

Author	O Wells/S Van Kal	
Checker	G R Walker	
Approver	C Plumb	

Report No UA007442-001-R001

Date July 2015

This report has been prepared for Neath Port Talbot Council in accordance with the terms and conditions of the appointment dated 18 January 2015. Hyder Consulting (UK) Limited (2212959) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

Revisions

Revision	Date	Description	Prepared By	Checked By	Approved By
02	July 2015	Second Issue – minor amendments	O Wells/S Van Kal	G R Walker	C Plumb
01	July 2015	First Issue	O Wells/S Van Kal	G R Walker	C Plumb

CONTENTS

1 INTRODUCTION 1
1.1 Limitations 1
1.2 Sources of Information 1
2 SITE DETAILS 3
2.1 Site Location and Description 3
2.2 Site History 3
2.3 Current Land Uses with Potential to Impact the Site 5
2.4 Historic Land Use with Potential to Impact the Site 5
2.5 Environmental Incidents and Permitting 6
2.6 Landfilling and Waste Sites 7
2.7 Geology 7
2.8 Economic Geology 8
2.9 Hydrology and Hydrogeology 8
2.10 Previous Ground Investigations 9
2.11 Man-made and Natural Geo-hazards 9
2.12 Potential Contaminant Sources 11
2.13 Potential Pathways and Receptors 11
3 FIELDWORK 13
3.1 Introduction 13
3.2 Exploratory Hole Locations 13
3.3 Cable Percussive Boreholes 13
3.4 Dynamic Sample Holes 14
3.5 Trial Pitting 15
3.6 Ground Instability 16
3.7 Obstructions and Excavation Difficulties 16
3.8 Installations / Backfilling 16
3.9 Land Gas and Groundwater Monitoring 17
4 LABORATORY TESTING 19
4.1 Geotechnical Laboratory Testing 19
4.2 Geo-Environmental Laboratory Testing 19
5 GROUND CONDITIONS 21
5.1 General Sequence of Strata 21
5.2 Topsoil 21
5.3 Made Ground 21

5.4 Blown Sand 22
5.5 Tidal Flat Deposits 23
5.6 Marine Beach Deposits 24
5.7 Glacial Deposits 24
5.8 Groundwater 24
6 CONTAMINATION CHARACTERISATION 25
6.1 Human Health Risk Assessment 25
6.2 Soil Assessment – Tier 1 Screening 26
6.3 Asbestos 30
6.4 Calorific Value / Loss on Ignition 30
6.5 Groundwater Risk Assessment 31
6.6 Gas Risk Assessment 32
7 Conceptual Model – Contaminant Linkages 33
7.1 Introduction 33
7.2 Contaminant Sources 33
7.3 Risk Assessment Methodology 33
7.4 Contaminant Linkages 34
8 Engineering Considerations 38
8.1 Foundations 38
8.2 Temporary works 39
9 Geotechnical Risk Register 40
10 REFERENCES 43

Figures and Appendices

FIGURES

FIGURE 1. SITE LOCATION

FIGURE 2 GEOLOGICAL SECTION FROM HISTORIC BOREHOLE INFORMATION

FIGURE 3 PART OF COAL AUTHORITY DEVELOPMENT RISK MAP FOR NEATH PORT TALBOT

FIGURE 4 EXPLORATORY HOLE PLAN

FIGURE 5. GEOLOGICAL CROSS SECTION FOR AFAN LIDO SITE

FIGURE 6. SUMMARY PARTICLE SIZE DISTRIBUTIONS

FIGURE 7. SUMMARY OF CLASSIFICATION TESTS FOR TIDAL FLAT DEPOSITS

FIGURE 8. STANDARD PENETRATION TESTS

APPENDIX A

STANDARD PROCEDURES

APPENDIX B

EXPLORATORY HOLE LOGS

APPENDIX C

GROUND AND GAS MONITORING

APPENDIX D

GEOTECHNICAL LABORATORY RESULTS

APPENDIX E

CHEMICAL LABORATORY ANALYSIS RESULTS

1 INTRODUCTION

Hyder Consulting (UK) Limited (HCL) was instructed by Neath Port Talbot Borough Council (NPTBC), 'the Client', on 18 January 2015 to undertake a combined geo-environmental and geotechnical assessment and ground investigation at Afan Lido, Port Talbot. The objectives of the assessment were to:

- Identify existing geo-environmental and geotechnical risks that may have detrimental impact on the site's future development;
- Design and implement an appropriate ground investigation to characterise the site in terms of its geo-environmental conditions and ground conditions;
- Provide a factual account of the fieldwork undertaken, results of *in situ* testing and the subsequent geotechnical and chemical laboratory testing undertaken on samples
- Determine a conceptual ground model of the site from which an assessment of the potential risk posed by contamination on or under the site can be determined;
- Provide a summary of the ground conditions and assess ground risks with appropriate recommendations for foundation options.

The future development of the site had not been determined at the time of the investigation.

1.1 Limitations

This report has been prepared for Neath Port Talbot Borough Council in accordance with the terms and conditions of appointment. HCL cannot accept any responsibility for any use of or reliance on the contents of this report by any third party. The copyright of this document, including the electronic format and any AGS data, shall remain the property of HCL.

HCL do not accept liability for any use of the information presented in this report unless it is signed by the author, checker and approver and marked as final

It should be noted that ground conditions between exploratory holes may vary from those identified during this ground investigation; any design should take this into consideration. It should also be noted that groundwater levels may be subject to diurnal, tidal, seasonal, climatic variations and those recorded in this report are solely dependent on the time the ground investigation was carried out and the weather before and during the investigation.

1.2 Sources of Information

The Client made available desk study information in the form of utilities drawings and historic maps, mainly derived from the Ordnance Survey, but also including other environmental source information. In addition to this information, Hyder sourced and reviewed information on the site that was available from a variety of sources. The sources of information therefore included:

- Groundsure Enviroinsight Report; 2013 (provided by NPTBC);
- Coal Authority Mining Report; 2013 (provided by NPTBC);
- Coal Authority Website: (https://www.gov.uk/government/organisations/the-coal-authority)

- LDP Strategic Housing Site Assessment Report; Section B Detailed Site Assessment: Port Talbot Spatial Area; August 2013. (provided by NPTBC);
- Sitecheck Report, Landmark Information Group; 2014. (provided by NPTBC);
- OS mapping tiles; (provided by NPTBC)
- Utilities information including – Western Power Distribution August 2013; Wales and West Utilities August 2013; BT Openreach dated 2007; BT Wayleave dated 2011; Linesearch Enquiry Dated August 2013; Dŵr Cymru, August 2013. Provided by NPTBC.
- British Geological Survey 1:50 000 scale mapping. Sheet 247, Swansea, Solid and Drift, 2011;
- British Geological Survey - Openscience website, 2015;
- Environment Agency
- BBC Wales News Report, December 2009.
- Port Talbot Historical Society

2 SITE DETAILS

2.1 Site Location and Description

The site is the former Afan Lido, located off Princess Way, Port Talbot, in the county borough of Neath Port Talbot in South Wales. The site is situated approximately 4 km (2.5 miles) from the centre of Port Talbot. The Ordnance Survey National Grid Reference for the site is 274700, 189500. Figure 1 presents the site location and general layout.

In total, the site comprises some 3.0 hectares and is split in to two parts: the north-western region and the south-eastern region. The north western region contains a dis-used lido (swimming pool) that has been demolished and this part of the site is currently disused. The former Lido site is surrounded by secure fencing, access is enabled through a secure gate. The south east section of the site comprises a car park for a small gym (currently in use) and further south is a field area which is currently open ground bounded by a low wall.

The site is generally flat. Ground levels across the majority of the site are approximately 10 m above Ordnance Datum (AOD) while the north-western site area is approximately 12 m AOD. The site is largely bound by residential properties along the periphery extending the north west to the south east, with the promenade sitting to the south west of the site.

2.2 Site History

The site history and that of the surrounding area is based on historical mapped data from Landmark Information Group [1]. The maps have various dates from 1876 to 1980 and comprise Ordnance Survey Maps. The table below summaries the development of the site based on the mapping available.

Table 2.1: Summary of features identified from historic maps

Year	Map Scale	Source	Detail
1876/77	1:2500	OS	The site area is undeveloped at this time and is within an area of dune sands termed *Aberafon Burrows*. East of the site area but on the west bank of the River Afan, a series of rail sidings termed the *sand sidings* connect to the Rhondda and Swansea Bay Railway These presumably were used to transport sand or mineral from the burrows, however no associated works are shown on the maps. The railway served Aberavan, the adjacent Mansel Tin Plate works and the developing port infrastructure of Port Talbot on the east bank of the river by way of the Cwm Afan Tramway.
1884/85	1:10560	OS	No change to the site area. No significant change to the surrounding areas
1899	1:2500	OS	No change at the site location. The rail heads have been extended to the south (following closely the line of the present Victoria Rd) and run along the North Pier which has been constructed to facilitate the railway. Jubilee Road is shown (now the route of Victoria Road) connecting Aberavan town to the beach head and pier. A band stand is located along the beach probably in the location of the current Jersey Quay just south of the site area. Further development at Port Talbot including major dredging of the River Afan Channel and development of the New Dock. Aberavan is shown with much new housing and industrial plants sited along the River Afan. There is some agricultural encroachment into the burrows north of

			the site and along the main rail lines.
1917	1:2500	OS	No change at the site location. North of the site, the rail siding have been re-routed and a brickworks is shown. Jubilee Road has been renamed Victoria Road and housing is shown extending from Aberavan part way towards the beach. At the beach, the Jersey Beach Hotel, skating rink and other buildings indicate that this area has a leisure use. The rail head onto the pier appears to have been removed. South west of the site, some potential reworking of the ground is indicated.
1921	1:10560	OS	No significant changes identified
1939	1:2500	OS	No change on the site. The mapping indicates some extensive housing development to the east as Aberavan significantly develops. The railway sidings through the burrows have been removed as well as the brickworks. Vivian Memorial Park with sports and recreation areas is shown at this time
1951/52	1:10560	OS	An enclosure is shown adjoining the lido site's northern boundary. This is shown containing a number of circular features possible above ground tanks. The general area of the burrows appears to have been further encroached by housing spreading out from Aberavan.
1952-1956	1:2500	OS	The mapping shows no development on the site or to the south of the site, but the land surrounding the north of site has been significantly developed with housing and infrastructure. Immediately adjacent the site are: • The Tywyn Primary school is shown to the north east; • At least six tanks are shown in the enclosed land north east of the site • An electric substation is shown north of the site • Two small enclosed parcels of land are shown on the site of Channel View – these are later shown as residential houses
1956	1:1250	OS	As above detail
1964	1:10560	OS	The map shows development of and along Princess Margaret Way to the south of the site and a layout for Channel View which crosses the site.
1961-1966	1:1250	OS	The western part of the site is shown to contain the Lido and sports centre with associated gardens and car parking and with access from Channel View and Bevin Avenue. The east part of the site is identified as car park. Tanks that were located in the newly developed sports field appear to have been removed or buried and are no longer shown. Houses are shown immediately the north west of the Lido (Carmarthen House (nos 1 to 32) and Lido Houses (nos 1 and 2).
1969	1:2500	OS	No significant change to site or immediate surroundings.
1980-1982	1:10000	OS	No significant change to site or immediate surroundings.
1980-1996	1:10000	OS	No change to the site area. A hotel and office complex are shown north east of the site along Bevin Avenue/Dalton Road

From the above and from historic news reports of Lido's history the key dates for the site are:

- 1964 to 1965 Development of lido site
- 1965 Official opening by HM The Queen

- December 19, 2009 Fire causes permanent closure of facility
- 2012, Demolition of the Lido complex to leave vacant site.

2.3 Current Land Uses with Potential to Impact the Site

Currently the site is disused and contains demolition rubble in the former Lido complex in the north western part and rough open ground with temporary structures housing a gym in the south eastern part.

There are two electricity sub stations located on or close to the site; one is 25 m outside the site boundary in the north west of the site, and one directly on the site in the far south eastern part of the site.

Within the general area the following trade entries are noted as potential contamination sources:

- Chroma Domestic Cleaning Neath, Sitwell Way, Port Talbot – 350 m SE
- Quay Engineering Service Ltd, Sitwell Way, Port Talbot – 350 m SE
- Puncture-Shield, 2 Webb Place Port Talbot – 500 m E
- Murco petrol station Princess Margaret Way - 500 m NW

2.4 Historic Land Use with Potential to Impact the Site

Based on the history of the site and surrounding area Table 2.2 summarises the nearby former activities that have been identified as possible sources of contamination.

Table 2.2: Historic Land Use

Source	Distance m	Direction	Period	Comment
Electric Sub Station	On Site	-	1965? to present	Local chemical impact
Lido Swimming Pool	On Site	-	1965 to 2009	Chemicals, heating and fuel storage
Tanks (six number)	40- 120	NE	1956 – 1964?	Unknown use
Electric Sub Station	40	N	1956 to present	Local chemical impact
Railway	65 m	SE	1899 - 1917	
Filled ground	80	S	1993	Unknown sources
Filled ground	100	S	1884	Unknown sources
Quarry/clay pit	350	NE	1917-1939	Brickworks and railway now infilled

In addition to the listed land uses given in Table 2.2, it should be noted that the site is situated some 1 to 2 km west of the main Port Talbot industrial sites and that these include an industrial legacy of several hundred years dating from around 1717 with the building of the Aberavan Forge [23]. The site is also approximately 2.5 km from the former petrochemical works at Baglan. A summary of the main industrial sites is given in Table 2.3 below.

Table 2.3: Summary of Major Industrial Sites near the Site

Activity	Distance km	Direction	Period	Comment
Afan Forge	2.8	NE	1717- 1822	Absorbed into Margam tinworks
Taibach Copper Works	5.0	E	1774 – 1925	One of the earliest major works
Port Talbot Chemical Works	1.25	NE	Circa 1875	Limited details but possibly related to gas production and later gas works?
Borrows Tin Plate Works	1.15	NE	1850? - 1953	Also called the Burrows?
Margam Tin Plate Works	2.2	NE	1822 - 1916	Converted to steel works 1916 and merged with Mansel works to form British Steel site
Mansel Tin Plate	1.45	NE	1874 – todate	Becomes British Steel in 1967
Afan Vale Tin Works	1.4	NE	1870? – 1915?	
Aberavan Gas Works	1.25	NE	1899 – 1996	
Cwmavon Works	3.85	N	1820 – 1920?	Coal, Steel, coke, copper mills, etc declining after 1920.
Baglan Petrochemicals	2.5	NW	1963 - 2004	Major European petrochemical site

2.5 Environmental Incidents and Permitting

2.5.1 Industrial sites holding Licenses

There are no listed industrial uses requirement permitting at the site or within 500 m of the site boundary. The closest listed users are:

- Murco petrol station Princess Margaret Way - 500 m NW – unloading petroleum to storage for commercial petrol station.

2.5.2 Recorded Pollution Incidents

One reported pollution incident is recorded at the site (List 2) and this relates to the release of air-borne pollutants resulting from the fire that affected the Lido in December 2009. Other List 2 incidents within 250 m of the site include are listed in Table2.4, there are no List 1 incidents.

Table 2.4: Pollution Incidents near the Site (List 2)

Date	Distance m	Direction	Medium	Comment
5 Apr 2001	163	E	Air: Smoke	Category 4 no impact
10 Dec 2001	165	NE	Air: Dust	Category 3 Air and Land (minor). Water Cat 4 (no impact)
28 Oct 2001	165	NE	Air: Fumes	Category 3 Air (minor). Land and Water Cat 4 (no impact)
25 Mar 2003	191	SE	Air: Dust	Category 3 Air and Land (minor). Water Cat 4 (no impact)

2.6 Landfilling and Waste Sites

No records of landfilling at the site have been recorded, however it is noted that NPTBC has supplied data for on-site landfill. It is presumed that this notification refers to the retention of demolition wastes on the site resulting from the demolition of the Lido site.

It should be noted that the published 1:50,000 scale British Geological Survey map of Swansea (BGS Sheet 247 [2]) shows the general site area to contain artificially modified ground (Landscaped Ground – redeveloped areas and other areas where extensive earth moving has occurred). The area of filling extends across the whole coastal plain of to the north west of Port Talbot and most likely relates to the use of steel slag fill to improve the generally poor ground conditions.

Steel slag contains more iron as free metal or oxides than blast furnace slag and typically have a greater variability in their composition. Due to the presence of free uncombined lime (CaO), magnesia (MgO) the slag readily reacts with water to form hydroxides, a reaction that can give rise to a large increase in volume over time.

Two waste refuse tips are recorded within the Groundsure data information [21] these are detailed in Table 2.5 below together with details of other waste sites and areas of undisclosed filling:

Table 2.5: Landfill and Waste Disposal

Activity	Distance m	Direction	Location	Comment
Refuse tip	905	NE	Not given	
Refuse tip	1155	NE	Not given	
Former Brick pits	350	NE	now adjacent Romney Road.	Infilled clay pits Unknown fill
Commercial and Industrial Waste	1300	E	Jem Recycling Old by-pass works Dock Road, Port Talbot	Expired permits – 1994 to 2000
Household Commercial and Industrial waste <25000 tonnes	1375	E	Paper Dragon Old by-pass works Dock Road, Port Talbot	Active licence since 2006
Clinical Waste Transfer	1125	NE	Neath and Port Talbot Hospital	Active since 2003

2.7 Geology

According to the British Geological Survey map of Swansea [2]) shows the general site area to contain artificially modified ground (Landscaped Ground – redeveloped areas and other areas where extensive earth moving has occurred) overlying a natural littoral sequence of Superficial Deposits which comprises Blown Sand, Storm Beach Deposits and Beach and Tidal Flat Deposits. These recent beach deposits generally are underlain by older Devensian Glaciofluvial Deposits which in turn overlie the Carboniferous South Wales Middle Coal Measures.

The Marine Storm Beach Deposits comprise cobbles and shingle, sand, silt and clay that may be bedded or chaotically deposited in the form of dunes, sheets or banks within a marine environment.

Blown Sand generally forms as dunes of pale brown fine grained sand, and is generally uncemented.

Tidal Flat Deposits generally form in sheltered environments and comprise normally consolidated soft silty clay with intermittent layers of sand, gravel and peat. The soils accumulate through a combination of aeolian processes with intervals of more active fluvial deposition from flooding or tidal surges.

The Glaciofluvial Deposits may be expected to comprise predominantly coarse granular materials and sands that may either be chaotic in nature or crudely sorted and bedded.

Beneath the superficial deposits, the solid geology comprises mudstone with coal seams, seatearth and thin sandstone beds.

A number of faults are shown on the geological mapping in the area of the site and the structure below the site is indicated to comprise a series of faulted blocks, generally downthrown toward the south. A series of thrust faults are indicated on the map, these generally strike in an east-west direction but have a northerly dip allowing strata to override toward the north. As a result the strata generally dips northwards. A second series of faults strike north-west to south-east: these are normal faults and appear to predate the thrust faults. The closest fault to the site is the Giant's Grave Fault, a normal fault that is within 250 m of the northern site boundary.

2.8 Economic Geology

The principal mineral resources in the area are summarised below:

- **Coal** - there are extensive mines and surface works in the general area surrounding Aberavan, however there are no mines or open cast works within 1 km of the site. Several coal seams were recorded in the mineral exploration borehole summarised in Table 2.6 but it would appear that the coal beneath the site was not economic to extract.

- **Sand and gravel** – there is evidence to suggest that the Blown Sands have been excavated in the past and that relatively small scale and localised surface works have been undertaken at various locations at and around the site since 1899.

- **Clay** – map records of brick making north of the site suggest that a brick pit was opened and operational between 1917 and 1950 some 450 m north of the site.

2.9 Hydrology and Hydrogeology

The site is located in a coastal location being approximately 150 m from the marked mean high tide at Aberavan Promenade. No surface water bodies are located on site and it is apparent that the site is well drained with generally little standing water. The nearest water body is therefore the sea. The Afon Afan is located some 850 m to the south east and flows southward into the sea and the River Neath flows into Swansea Bay some 3.5 km north of the site. It may therefore be expected that any groundwater flows will generally be southwards towards the coast and river estuary.

The Superficial Deposits are classed as a Secondary A aquifer and presumably have moderate intergranular permeability.

The underlying coal measures bedrock is also designated as a Secondary A aquifer throughout the site extents. It is considered that generally the permeability within the bedrock will be fracture controlled, there are however laterally extensive beds of sandstone within the sequence which may provide some intergranular flow.

There are no recorded groundwater abstractions that impact on or near the site. The closest abstractions relate to non-potable water abstraction to supply the Port Talbot Docks, more than 1 km to the east of the site.

2.10 Previous Ground Investigations

No details of previous ground investigation are available. However, several boreholes pertinent to the site were located on the BGS database [3] and are summarised below in Table 2.6, their approximate locations are shown on the site plan. The boreholes were drilled between 1892 and 1905 with a stated aim of assessing coal reserves and water supply; consequently, the bores extend to several hundred metres and intersect several coal seams. Due to the age of the logs, the terminology used on the logs and nature of the records are archaic.

A further series of boreholes were drilled in 1952 for an extension of the Aberavan promenade, these boreholes were between 10 and 15 m deep and penetrated into the Tidal Flat Deposits. The 1952 holes are not readily located in plan, but do indicate that the water level in the Blown Sand along the promenade strip was approximately between 4.5 m and 5 m OD at that time.

Table 2.6: Summary of Previous Boreholes Records

	Depth to Base of Strata m bgl		
Stratum	BGS 01	BGS 02	BGS 03
Made Ground	None	None	None
Blown Sand	5.79	6.40	5.79
Tidal Flat Deposits	19.39	22.55	15.85
Marine Beach Deposits	24.38	30.63	24.69
Glacial Till	32.31	40.69	Absent?
Middle Coal Measures	Depth not proven	Depth not proven	Depth not proven

Notes

BGS 01 – No 3 BH Aberavan Marshes 1903. BGS ID 370933 Ref SS78NW9. Location 274650, 189900. Total Length 405 m

BGS 02 – Aberavan Burrows No 1 BH, 1893. BGS ID 370932 Ref SS78NW8. Location 274660, 189290. Total Length 429.76 m

BGS 03 – N02 BH Aberavan Marshes, 1905. BGS ID 370915 Ref SS78NE302. Location 275010, 189550. Total Length 273.7 m

A conceptual geological section based on the above borings is presented in Figure 2.

2.11 Man-made and Natural Geo-hazards

The level of risk is assessed as a function of the severity of a particular hazard and its likelihood to occur. The following terms and scales are used to assess the risk.

Table 2.7: Risk Assessment Parameters

Score	Likelihood	Severity
1	Negligible	Very Low – minor injury, no significant time or cost
2	Unlikely	Low - Minor injury, minor loss of time, low cost
3	Occasional	Medium - Reportable incident, delays, local damage, significant costs
4	Probable	High – Major injury with long term effect, excessive project cost
5	Very Likely	Major Impact – Fatality, project closure

The following table provides a summary of the geotechnical risks that have potential to influence the proposed development. The level of risk may be reduced after appropriate mitigation measures are adopted.

Table 2.8: Risk Assessment

No	Hazard	Cause	Severity	Likelihood	Risk	Potential Mitigation
1	Subsidence	Made ground placement	2	3	6	Inspect footing for loose materials and compact
2	Subsidence	Mine workings	4	1	4	See CA report
3	Heave	Expansive Slag	3	2	6	Assess, remove or avoid
4	Subsidence	Quarry infill	4	1	4	Not required
5	Subsidence	Collapsible soil	2	2	4	Not required
6	Settlement	Compressible soil	2	4	8	Appropriate foundation design, treatment
7	Chemical attack	High Sulphate/low pH/chloride	3	3	9	Assess, remove, protect at risk elements
8	Contamination	Pollutants	2	4	8	Assess, design mitigation
9	Slope stability	Running Sand	3	4	12	Assess, design, stabilise
10	Temporary Excavation	Running Sand	4	4	16	Assess, dewater/shore
11	Obstructions	Existing Foundation	2	4	8	Locate, avoid/remove/cap
12	Ground Gas	Organic matter	4	4	16	Assess and mitigate
13	Unstable ground	Earthquake	2	2	4	Not required

Risk Level

≤4	Negligible	no specific action required
5 to 7	Low	review to see if further risk reduction is possible by low cost options
8 to 11	Medium	Consider alternate design/construction options; residual risks noted.
≥12	High	Seek alternate solutions; specify precautions and inform designer

Assessment will generally be carried as part of the ground investigation and the outcomes are discussed in Section 4 below.

With regard to the risk of subsidence due to mining of coal, the Coal Authority (CA) report for the site [16], states that the site is not within the zone of likely physical influence on the surface from past or present workings, and is not in an area likely to be affected by future workings. An extract of the CA Development Risk Map for Neath Port Talbot is presented as Figure 3. Based on the CA report and Development Risk Map, it may be considered that the risk due to mine workings is low.

2.12 Potential Contaminant Sources

Sections 2.4, 2.5 and 2.6 have identified a number of potential sources of contamination in the vicinity of the site. Sources within 500 m of the site generally are relatively small in scale (electrical sub stations, storage tanks etc), and tend to be relatively recent (post 1950). As such their ability to impact the site is considered to be comparatively low. Such sources may provide locally raised levels of contaminants but would not be expected to impact the whole site.

A larger source may be the previous use of the north western part of the site, which formerly housed the lido building and which may have greater potential to impact the site due to storage of chemicals or fuel.

The presence of made ground in the south eastern part of the site used mainly as a carpark, may have given rise to the placement of blast furnace slag which could contain high levels of sulphate and heavy metals.

The influence of major industrial sites located 1.5 km to 3 km from the site should also be considered. These sites have the potential to significantly impact the site should a suitable pathway mechanism exist.

2.13 Potential Pathways and Receptors

A preliminary assessment of contaminant pathways and receptors is provided based on the desk study information available for current and former adjacent site usages and assuming that the site will be developed for residential use.

Table 2.9: Potential Pathway-Receptor Links

Source		Pathways	Receptors	Anticipated Risk
On site	Made Ground Demolition Rubble Chemical Storage Electrical Substation	Dermal Contact Ingestion Groundwater migration Excavation/Transport Construction Airborne	Construction Workers	Low
			Occupiers	Moderate
			Buildings	Moderate
			Beach Front	Negligible
Off site	Chroma Cleaning, Port Talbot Quay Engineering, Port Talbot Puncture Shield, Port Talbot		Sea	Negligible
			Aquifers	Negligible
		Groundwater migration Airborne Construction fill	Occupiers	Low
			Construction Workers	Low

	Petrol Filling Station Underground Tanks Major Industrial Sites Railway		Buildings	Negligible

The groundwater pathway for offsite contaminant source to on-site receptors assumes that the principal sources are located downstream of the site location and hence have low or negligible effect on the site. Airborne deposition and accumulation on-site of contaminants from off-site sources may therefore prove the most likely pathway.

3 FIELDWORK

3.1 Introduction

Site investigation works were undertaken between the dates of 16th February and 2nd March 2015.

The scope of the ground investigation, location and depth of types of exploratory holes, was determined by HCL. Supervision of the site investigation and the logging of all investigation positions was undertaken by a suitably experienced HCL engineers.

The original scope of the investigation is summarised in Table 3.1.

Table 3.1: Original Scope of Investigation

Location (s)	Method	Target Depth (m bgl)	Rationale
BH01–BH03	CP	25	Understand sequential geology in area, obtaining level of rockhead if possible; determine soil geotechnical parameters, assess potential contamination and determine long term gas and water levels.
WS141–WS148	DS	5	Determine soil geotechnical parameters, assess potential contamination and determine long term gas and water levels.
TP121 – TP137	TP	3	Obtain ground conditions near surface, investigating likelihood of contamination.

Notes
TP = Trial Pitting, CP = Cable Percussive boring, DS = Dynamic Sampling

Standards and procedures adopted during the investigation are detailed in Appendix A.

3.2 Exploratory Hole Locations

The co-ordinates and elevations of the exploratory hole locations were obtained by John Vincent Surveys using a GPRS system allowing an accuracy +/-50 mm.

An exploratory hole location plan is presented in Figure 4 with the corresponding exploratory hole logs presented within Appendix B. The co-ordinates and elevations of the ground surface at each exploratory hole location is noted on the corresponding exploratory hole log.

3.3 Cable Percussive Boreholes

Three cable percussive boreholes were undertaken between 16th February and 2nd March 2015 using two Dando 2000 drilling rigs.

The completed scope of cable percussive work is summarised in Table 3.2 below. Cable percussion boring was advanced using standard tools and utilised two casing strings in each borehole, boring commenced using a nominal 200 mm diameter casing and completed with 150 mm diameter hole as noted on the exploratory hole logs.

Standard penetration tests (SPT) were undertaken in the cable percussive boreholes nominally at 1.0 m intervals to depths of 5 m bgl and then at 1.5 m interval to the base of the borehole. The resulting SPT N-values are presented on the relevant borehole logs. Where the penetration resistance was low, generally below 5 blows per 300 mm, the SPT was 'double driven' by driving and recording the blows for an additional 300 mm of penetration without withdrawing the test apparatus. This allowed for an assessment of soil disturbance in the base of the borehole to be made, as loose or soft soils may be prone to excessive disturbance during the drilling operations. Such tests indicated on the logs with an asterix.

Table 3.2: Cable Percussive Borehole Summary

Exploratory Hole ID	Achieved Depth (m bgl)	Notes
BH101	26.82	Drilling encountered difficulties including blowing sands and very dense gravel and cobbles. Borehole terminated in Marine Beach Deposits. Dual installation installed.
BH102	27.45	Drilling encountered difficulties including blowing sands and very dense gravel and cobbles. Borehole terminated in Marine Beach Deposits. Dual installation installed.
BH103	30.40	Drilling encountered difficulties including blowing sands and very dense gravel and cobbles. Borehole terminated in Glacial Till. Dual installation installed.

3.4 Dynamic Sample Holes

Dynamic sampling was undertaken at nine locations. This element of fieldwork was completed between 17th February 2015 and 18th February 2015.

Drilling was completed using a Dart 224 drilling rig and the completed scope of sampling is summarised in Table 3.3 below.

Table 3.3: Windowless Sampling Termination Depths

Exploratory Hole ID	Termination Depth (m bgl)	Notes
WS141	4.45	Terminated on engineers instruction and backfilled with bentonite.
WS142	4.45	Terminated on engineers instruction and backfilled with bentonite
WS143	2.34	Hit refusal on SPT (c) test at 2 m. Hole terminated and moved to location WS143A. Backfilled
WS143A	2.00	Monitoring installation to 2.0 m
WS144	5.45	Monitoring installation to 5.0 m.
WS145	7.24	Terminated on engineers instruction and backfilled with bentonite
WS146	5.45	Monitoring installation to 5.0 m.
WS147	5.45	Monitoring installation to 5.0 m.

Exploratory Hole ID	Termination Depth (m bgl)	Notes
WS148	5.43	Monitoring installation to 5.0 m.

3.5 Trial Pitting

Machine excavated trial pitting was undertaken at 17 locations between the dates of the 16th February 2015 and the 19th February 2015. Trial pitting was completed using a JCB 3X (a breaker was used at applicable locations where concrete or paving was present at the surface). The completed scope of pitting is summarised in Table 3.4 below.

Table 3.4: Trial Pitting Termination Depths

Exploratory Hole ID	Termination Depth (m bgl)	Notes
TP121	2.6	Severe collapse with repeated excavation below 1.6 m; excavation terminated at 2.6m to prevent undermining surrounding land.
TP122	2.7	Severe collapse with repeated excavation below 1.4 m; excavation terminated at 2.7 m to prevent undermining surrounding land.
TP123	2.7	Severe collapse with repeated excavation below 1.2 m; excavation terminated at 2.7 m to prevent undermining surrounding land.
TP124	3.2	Severe collapse with repeated excavation below 1.6 m; excavation terminated at 3.2 m to prevent undermining surrounding land.
TP125	3.4	Severe collapse with repeated excavation below 1.6 m; excavation terminated at 3.4 m to prevent undermining surrounding land
TP126	3.2	Severe collapse with repeated excavation below 1.05 m; excavation terminated at 3.2 m to prevent undermining surrounding land
TP127	2.4	Yellow pipe encountered at 0.62 m. No emissions from pipe, no bedding observed surrounding pipe. Possible waste pipe or redundant gas pipe. Severe collapse with repeated excavation below 1 m; excavation terminated at 2.4 m to prevent undermining surrounding land.
TP128	3.6	Severe collapse with repeated excavation below 1.05 m; excavation terminated at 3.6 m to prevent undermining surrounding land.
TP129	3.6	Severe collapse with repeated excavation below 1.2 m; excavation terminated at 3.6 m to prevent undermining surrounding land.
TP130	2.6	Severe collapse with repeated excavation below 0.8 m; excavation terminated at 2.6 m to prevent undermining surrounding land.
TP131	2.7	Severe collapse with repeated excavation below 0.6 m; excavation terminated at 2.7 m to prevent undermining surrounding land.
TP132	3.4	Severe collapse with repeated excavation below 1.4 m; excavation terminated at 3.4 m to prevent undermining surrounding land.
TP133	2.8	Severe collapse with repeated excavation below 1 m; excavation terminated at 2.8 m to prevent undermining surrounding land.

Exploratory Hole ID	Termination Depth (m bgl)	Notes
TP134	3.1	Corroded steel mesh reinforcement encountered at 1.05 m depth. Concrete foundation exposed at 1.1 m (1.4 m visible length). Severe collapse with repeated excavation below 1.4 m; excavation terminated at 3.1 m to prevent undermining surrounding land.
TP135	2.8	Impersistent clay horizons at 0.80 m depth. Severe collapse with repeated excavation below 0.95 m; excavation terminated at 2.8 m to prevent undermining surrounding land.
TP136	2.75	Timber length encountered at 1.3 m depth. Aligned horizontally. Severe collapse with repeated excavation below 1.35 m, excavation terminated at 2.75 m to prevent undermining surrounding land.
TP137	3.4	Severe collapse with repeated excavation below 2 m, excavation terminated at 3.4 m to prevent undermining surrounding land.

3.6 Ground Instability

During the site investigation, all of the trial pits undertaken were unstable typically below depths of 1 m to 1.5 m. The instability occurred in the absence of groundwater. Descriptions of short-term ground instability were made on the relevant log and are summarised in Table 3.4.

3.7 Obstructions and Excavation Difficulties

During the ground investigation, obstructions and excavation difficulties were encountered in a number of the investigation positions as presented on the engineering logs.

Surface obstructions were generally broken out using a hydraulic breaker attached to the arm of the JCB excavator. Seven trial pits and four dynamic sampling locations required breaking out in order to advance the exploratory hole.

During the cable percussion drilling, a condition of blowing sand was encountered. This occurred when the hydraulic head of water was insufficient to counter-act the uplift force due to removal of material within the borehole. This condition is analogous to running sand conditions in open excavations.

Boreholes that progressed below 25 m bgl encountered very dense coarse gravel, cobbles and boulders which proved necessary to chisel.

3.8 Installations / Backfilling

Backfill and installations were carried out as described in the table below:

Table 3.11: Installation and Backfill details

Exploratory Hole ID	Response Zone (m bgl)	Response zone detail and strata screened
BH101	24.5 to 26.8	19 mm ID piezometer pipe installed from gl to 26.8 m.
		50 mm ID standpipe installed from gl to 6 m (1 m plain over 5 m

Exploratory Hole ID	Response Zone (m bgl)	Response zone detail and strata screened
		slotted). Concrete gl to 0.3 m bgl; bentonite seal 0.3 to 1.0 m bgl, gravel (6 mm) 1.0 to 5 m bgl, bentonite pellet 6 to 26 m bgl. Gravel (6 mm) 24.5 to 26.82 m bgl.
BH102	25.0 to 27.45	19 mm ID piezometer pipe installed from gl to 26.82m. 50 mm ID standpipe from gl to 6 m (1 m plain over 5 m slotted). Concrete gl to 0.3 m bgl, bentonite seal 0.3 to 1.0 m bgl, gravel (6 mm) 1.0 to 6.0 m bgl, bentonite 6.0 to 25.0 m bgl. Gravel (6 mm) 25 to 27.45 m bgl.
BH103	28.6 to 30.4	19 mm ID piezometer pipe installed from gl to 30.40 m. 50 mm ID standpipe from gl to 7 m (1 m plain over 6 m slotted). Cement seal gl to 0.3 m bgl, bentonite 0.3 to 1.0 m bgl, gravel (6 mm) 1.0 to 6 m bgl, bentonite 6 to 28.6 m bgl. Gravel (6 mm) 28.6 to 30 m bgl.
TP121-TP137	N/A	Backfilled with excavated material and compacted with JCB3X.
WS141	N/A	No installation
WS142	N/A	No installation
WS143	N/A	No installation
WS143A	0-2	50 mm ID standpipe from gl to 2 m (1 m plain over 1 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1.0 -2.0 m bgl.
WS144	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0m bgl, gravel (6 mm) 1-5 m bgl.
WS145	N/A	No installation
WS146	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1-5 m bgl.
WS147	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1-5 m bgl.
WS148	0-5	50 mm ID standpipe from gl to 5 m (1 m plain over 4 m slotted). Cement seal 0-0.3 m bgl, bentonite 0.3-1.0 m bgl, gravel (6 mm) 1-5 m bgl.

3.9 Land Gas and Groundwater Monitoring

Land gas and groundwater monitoring was undertaken on three return visits on 25th March, 9th April 2015 and 22nd May 2015. Additional visits were made to the site for monitoring as access to parts of the site was not possible due to damage to site compound locks.

The results of each monitoring visit are presented within Appendix C

4 LABORATORY TESTING

Geotechnical and chemical laboratory testing was undertaken on selected samples obtained from the exploratory holes with the full results included in Appendix D and E. Testing of all samples was scheduled by a HCL Geotechnical and Geo-environmental Engineer with testing undertaken by a HCL approved laboratory.

4.1 Geotechnical Laboratory Testing

The geotechnical tests detailed in Table 4.1 were carried out in accordance with BS1377:1990 Methods of test for soils for civil engineering purposes [10] and BRE Special Digest 1:2005 Concrete in Aggressive Ground [13]. Results of the geotechnical laboratory testing are presented in Appendix D.

Table 4.1: Geotechnical Testing

Type of Test	Number of Samples
Moisture Content	27
4 Point Liquid and Plastic Limit	6
Particle Size Distribution - Wet Sieve	18
Sedimentation (hydrometer)	3
One dimensional consolidation (4 day)	4
Quick undrained Triaxial Compression (single)	4
BRE Suite	3
Water Soluble Sulphate 2:1 Extract	12
pH	12
Loss of ignition	5
Total Sulphur Content	9
Chloride Content	9

4.2 Geo-Environmental Laboratory Testing

Tables 4.2 and 4.3 detail the chemical testing undertaken on soil and water samples obtained during the ground investigation. Results of the chemical laboratory testing are presented in Appendix E.

Table 4.2: Geo-environmental Soil Testing

Type of Test	Number of Samples
Heavy metal suite	33
Inorganic compounds	33
Total Phenol	33
PAH	33
TPH-CWG	1
BTEX	1

Table 4.2: Geo-environmental Water Testing

Type of Test	Number of Samples
Heavy metal suite	4
Inorganic compounds	4
Total Phenol	4
PAH	4
TPH-CWG	4

5 GROUND CONDITIONS

5.1 General Sequence of Strata

A summary of the strata encountered by the exploratory holes is provided in Table 5.1 below and a cross section showing the distribution of the various strata below the site is presented within Figure 5.

Table 5.1: Summary of Ground Conditions

Stratum	Thickness Min / Max / Avg m	Level Range (max/min) m OD	Comment
MADE GROUND and TOPSOIL	0.12 / 2.90 / **0.98**	10.73 to 7.72	Topsoil only encountered BH102, BH103, WS148 and TP1127
BLOWN SAND	5.70 / 10.90 / **7.76**	9.16 to -3.18	Encountered in all holes; thickness proven only in BH101 BH102 and BH0103
TIDAL FLAT DEPOSITS	9.00 / 14.10 / **12.30**	2.74 to -11.06	Encountered in BH101, BH102 and BH103
MARINE BEACH DEPOSITS	5.00 to 8.30	-11.06 to -21.93	Only penetrated in BH103 and historic BGS bores.
GLACIAL TILL	7.93 to 10.06	-16.06 to -31.99	Encountered in BH103 and historic BGS bores.
SW Middle Coal Measures	Not proven	Below -25	From historic BH data only

The findings of the ground investigation are generally in agreement with the geological mapping and historic boreholes located near to the site and which are shown in the geological cross sections in Figure 2 as well as in the section presented in Figure 5.

5.2 Topsoil

Topsoil was generally absent over the site area and only a thin cover of topsoil was observed where present. Topsoil was typically encountered in areas previously used for grass lawns (BH102, BH103, TP123 and WS148).

5.3 Made Ground

Made ground was typically encountered at the surface in the majority of exploratory holes. In the south-east region, the previous land use had been mainly open ground for car parking, and in this area the made ground was predominantly some 0.5 m to 0.8 m thick. The made ground in this region generally comprised granular fill with a high proportion of aerated slag with a wide range of grain sizes up to small boulder size (350 to 400 mm).

In the north-west region previously occupied by the Lido, the made ground generally comprised either a concrete or bitumen surface that required breaking out over granular fill with high slag

content. This filled layer was generally underlain by a mixed layer derived from the underlying Blown Sand that had been disturbed and replaced with minor inclusions of brick and or slag.

Within the former Lido pool area, the trial pits indicated a layer of coarse and very coarse demolition rubble and in this area the thickness of made ground appears to increase matching the levels of former construction (2.9 m of made ground encountered in BH102).

A limited number of SPTs were recorded in the made ground and gave variable results with N-values ranging between 10 blows per 300 mm and refusal (full penetration not achieved after more than 50 blows).

Laboratory testing indicated that moisture contents were variable between 6% and 49% (average of 10 tests being 17%).

Chemical tests for aggressive ground conditions are summarised in Table 5.2

Table 5.2: Made Ground Chemical Testing

Test	Units	No of determination	Average	Min	Max	SD
Acid soluble Sulphate	% SO4	2	0.07	0.06	0.08	-
Water soluble Sulphate	g/l SO4	8	0.06	0.01	0.16	0.05
Chloride	% NaCl		No chloride present			
pH		11	8.15	6.7	10.16	1.08
Total Sulphur	%	8	0.08	0.05	0.11	0.02
Potential Sulphate	%	8	0.23	0.15	0.33	0.07
Loss on ignition	%	2	1.25	0.6	1.9	-

The above testing suggests that the soils are within Design Sulphate Class DS2 of the BRE SD1 [13] system and that the assessed chemical environment for concrete (ACEC) is AC2. Therefore limited special measures will be required for the design of concrete that is in contact with the ground.

5.4 Blown Sand

The area now occupied by the site was once part of an extensive system of aeolian sand dunes that was historically known as Aberavan Burrows. It may be anticipated that as with other such dune formations, the surface profile of the dunes would have been highly irregular and that in order to build on this surface it would be necessary to excavate, fill and level the surface to the desired profile. It is also possible that the prepared surface was stabilised with slag prior to construction.

The blown sand encountered during the investigation was typically described as medium dense pale brown, orange-brown to yellow-brown slightly silty fine to medium SAND with occasional cemented laminae up to 30 mm thick and rare coarse gravel size grey mudstone and shell fragments Occasional closely spaced impersistent lenses up to 10 mm thick of soft blue-grey organic silty clay are indicated in places.

Laboratory testing undertaken on the strata included particle size distributions and a summary of the grading curves obtained is presented in Figure 6a. The tests confirm that the Blown Sand are highly uniform fine to medium sand with typically less than 5% coarse sand to medium gravel and less than 5% silt and clay.

Chemical test for aggressive ground conditions were undertaken on four specimens; the results indicate that pH is between 8.1 and 8.7, soluble sulphates are low at 10 mg/l to 20 mg/l and that total potential sulphate is between 0.21% and 0.24%. At these levels, the results suggest that the soils are within Design Sulphate Class DS1 of the BRE SD1 and that the assessed chemical environment for concrete (ACEC) is AC1. However more aggressive conditions were noted in the assessment for made ground and the requirements for the design of concrete that is in contact with the ground should be based on those values.

SPT N-values were determined for the strata and gave an absolute range between 3 blows per 300 mm and 93 blows per 300 mm (the latter value determined by extrapolation from penetration at refusal). The distribution of SPT N-value with depth is shown in Figure 8, from which it is clear that the majority of data falls below an N-value of 20 blows and further, the data suggests the SPT value does not significantly improve over the range 10 m OD to 5 m OD; over this range a cautious estimate of the typical N-value may be around 10 blows per 300 mm which corresponds to an angle of shearing resistance of 30°. High determinations of SPT N-value are likely to reflect the presence of gravel or cobble size clasts incorporated within the material or weakly cemented horizons.

The stability of the sand in open excavation was poor as proved by the trial pits where repeated sidewall collapse limited the depth of excavation.

5.5 Tidal Flat Deposits

The Tidal Flat Deposits are indicated to consist of interlayered sand, silt and clay units which locally form distinct lenses or beds several metres thick but which are individually interlaminated with sand, silt or clay. In such mixed soils, the engineering properties are usually dominated and controlled by the weaker less competent materials, generally these are the clay layers.

A number of UT100 samples were taken of the Tidal Flat Deposits, however it was noted that due to the soft and interlaminated nature of the soil sample disturbance appeared to be relatively severe and therefore some caution will be required in assessing the results of tests from the samples.

Eight particle size distribution analyses were undertaken on soil samples from the Tidal Flat Deposits, and are summarised in grading envelope presented as Figure 6b. Most of the test results indicate a high proportion of fine material (silt and clay combined), with between 48% and 93% silt and clay content. Generally the clay content is between 15% and 30%, which is normally a sufficiently high percentage of clay to allow this material to dominate the soil's behaviour. One particle size distribution lies outside of the main envelope; this sample is assumed to be from a sand lens within the Tidal Flat Deposit is considered to represent a layer of aeolian sand within the Tidal Flats and indicates the range of materials and processes being deposited in a littoral environment over time.

The clay is described as soft to firm grey, blue-grey green-grey slightly organic slightly sandy and silty with occasional lenses of peat. A number of classification test results are summarised and presented as Figure 7; the tests indicate that the moisture content of the soil lies approximately midway between the range of plastic and liquid limits and that the soil is normally consolidated to lightly over consolidated and of intermediate plasticity.

The average SPT N-value for the Tidal Flat Deposits is 20 blows per 300 mm, however, inspection of the plot of SPT data with reduced level presented in Figure 8 indicates that the SPT N-values decrease from around 25 blows per 300 mm at 3 m OD to about 8 blows per 300 mm at -10 m OD. Therefore some caution in selection of SPT N-values for design is recommended.

N-values of around 10 blows per 300 mm equate to approximate undrained shear strengths of between 45 kPa and 50 kPa; these values are considerably higher than the determined undrained shear strength from samples tested in triaxial tests which indicate shear strengths of less than 10 kPa.

The one-dimensional consolidation tests reveal coefficients of volume compressibility of between 0.21 m^2/MN and 0.28 m^2/MN for pressure ranges up to 350 kPa suggesting that this strata is normally or lightly consolidated and liable to settle under high loads.

5.6 Marine Beach Deposits

The Beach deposits are described as dense grey clayey silty sandy gravel with medium cobble content. Gravel and cobbles are sub-angular to rounded often flat to tabular interpreted to be glacial deposits worked by coastal processes.

SPT N-value range from 34 blows per 300 mm to more than 100 blows per 300 mm (based on extrapolated from penetration at refusal) and correspond to an angle of shearing resistance of at least 37°.

5.7 Glacial Deposits

The glacial deposits are described as very stiff to hard dark grey to grey-brown slightly sandy gravelly clay with occasional to frequent cobbles. Coarse fragments are sub-rounded to sub-angular sandstone. SPT N values are greater than 50 indicating undrained shear strengths in excess of 250 kPa.

5.8 Groundwater

Groundwater was encountered both during the investigation and within installations within boreholes. Generally the observations of groundwater made during the investigation are transitory and do not fully represent the actual long term conditions at the site. Post fieldwork observations should therefore be used to confirm the long term situation.

The highest level of water in post fieldwork observations between March and May 2015 were found to be between 6.76 m OD (BH101 – east site) and 4.42 m OD (BH102 – west side of site). The levels observed are in agreement with the historic levels recorded during 1952 which indicate that the groundwater level was around 6 m OD.

During the post site observations and during the fieldwork, readings of groundwater were taken several times during the day to see if any correlation and change in level with tidal cycle occurred. The results were inconclusive and further monitoring over a full 24 or 48 hr period is recommend to establish this relationship.

6 CONTAMINATION CHARACTERISATION

6.1 Human Health Risk Assessment

6.1.1 Soil Screening Values

The following section details the approach undertaken with regards to selecting the appropriate Soil Screening Values (SSVs).

At the first tier of risk assessment, "Tier 1", sometimes referred to as soil screening, or Generic Risk Assessment, the relevant scientifically based authoritative criteria to assess soils are the Soil Guideline Values (SGV) published during and post 2009. These were derived using the Contaminated Land Exposure Assessment (CLEA v1.06) model by the Environment Agency [16]. This report follows this approach. To date, SGV for eleven contaminants (arsenic, nickel, mercury, selenium, cadmium, benzene, toluene, ethylbenzene, xylene, dioxins, polychlorinated biphenyls, and phenol) have been published. The Industry (LQM/CIEH and EIC) has developed Generic Assessment Criteria (GAC) for other substances which are widely used.

An SGV (or GAC) represents a cautious estimate of concentration of contamination in soil at which there is considered to be no risk to human health or a minimal chronic (long term) health risk. This however, does not mean an unacceptable risk actually exists at the recorded concentrations – there may be site-specific conditions that prevent the risk reaching an unacceptable level. The SGV/GAC therefore provides a value of soil contamination above which triggers further actions that should be undertaken to make sure that human health is protected; such actions may be further investigation or simple forms of remediation or investment in detailed quantitative risk assessment. They are not statutory standards that must not be exceeded. Although an SGV is an authoritative, scientifically based value published by the Environment Agency, a GAC has no less science applied; it is however derived by a non-Environment Agency source.

At the beginning of 2015, LQM/CIEH published updated GAC values called Suitable 4 Use Levels (S4ULs) [19][1]. These S4ULs represent minimal risk to receptors. They have been derived using the CLEA v1.06 model / methodology but the exposure model has been revised to represent the current assumptions published by Defra in 2014 [19]. These are considered to be the most up to date GACs and therefore have been used within the assessment that follows.

In the case of Lead, the withdrawn SGV (450mg/kg) had tended to be utilised, as no other published GAC was available. In 2014, Category 4 Screening Levels (C4SLs) were derived / published with regards to the Part 2A regime and are considered to represent low risk. For the assessment of Lead, the C4SL has been used as it is deemed more appropriate to use this value (200mg/kg) for the initial screen than the withdrawn SGV.

For organic contaminants SGVs/GACs are dependent on the Soil Organic Matter (SOM) content, with an increase in SOM corresponding with an increase in SGV/GAC. The SGV/GACs/S4ULs have been derived at 1%, 2.5% and 6% SOM, to correspond with low organic Made Ground (1%) and topsoil (6%) and intermediate material (2.5%). Accordingly, for

[1] Copyright, Land Quality Management Limited reproduced with permission Publication Number S4UL3223. All rights reserved.

conservatism, this assessment herein has been undertaken using SSVs calculated for a 1% SOM.

The Afan Lido site is being promoted by the Council as a mixed use development, including elements of residential, tourism and recreational uses and therefore SSVs for a residential with plant uptake scenario has been considered appropriate for this assessment. This is the most standard sensitive land use and therefore provides a precautionary approach to Tier 1 screening.

6.1.2 Averaging Area

For the initial screening process the whole site has been considered as one averaging area, however the chemical results have been separated into their different strata (ie Made Ground and natural soils).

6.2 Soil Assessment – Tier 1 Screening

Three cable percussive boreholes, eight dynamic sample exploratory holes and 17 trial pits were undertaken across the site. In total 33 samples (29 Made Ground and 4 Natural Ground) were taken from these exploratory holes and analysed for a suite of organic and inorganic contaminants. Asbestos screening and calorific value were also scheduled on samples.

6.2.1 Inorganics

The following tables present a summary of the inorganic results for the Made Ground and natural soils.

Table 6.1: Summary of Analytical Chemical Testing Results for Made Ground (Inorganic)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSV (mg/kg)	Exceedances (Yes / No) / Location
Arsenic	29	8.3	1200	37(1)	YES – WS145 / TP132 / TP137 / TP128 / TP133 / WS142/ WS148 / WS147
Boron	29	0.3	2.6	290(1)	NO
Cadmium	29	< 0.2	64	11(1)	YES – TP132 / TP133 / WS147
Chromium VI	29	< 4.0	< 4.0	6(1)	NO
Chromium	29	2.6	41	910(1)	NO
Copper	29	7.7	3900	2400(1)	NO
Lead	29	7.8	2400	200 (2)	YES – WS145 / TP132 / WS141 / TP128 / WS142 / WS148/ WS147 / TP133 / BH101 / TP126 / TP137
Mercury	29	< 0.3	< 0.3	40(1)	NO

Nickel	29	4	100	180(1)	NO
Selenium	29	< 1.0	3.3	250(1)	NO
Zinc	29	35	47000	3700(1)	YES – TP132 / WS148 / WS147 / TP133
pH (pH Units)	29	8.0	10.7	6-9	YES – TP136

1 LQM/CIEH – S4ULs published values (2nd Edition)
2 Defra - C4SL

The above table illustrates that there are exceedances of several inorganic compounds (arsenic, cadmium, lead and zinc) within the Made Ground. The majority of exceedances are located in the northern section of the site. Many of the exploratory holes encountered slag fragments within the soil matrix and this could be the source of the elevated contaminants.

One pH value was recorded above the upper threshold of 9, which indicated that the made ground soil in TP136 is alkaline in nature. Across the site the pH is generally neutral to slightly alkaline.

Table 6.2: Summary of Analytical Testing Results for Natural Ground (Inorganic)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSVs (mg/kg)	Exceedances (Yes / No) / Location
Arsenic	4	14	53	37(1)	YES – TP123
Boron	4	0.3	0.3	290(1)	NO
Cadmium	4	< 0.2	< 0.2	11(1)	NO
Chromium VI	4	< 4.0	< 4.0	6(1)	NO
Chromium	4	3.2	6.4	910(1)	NO
Copper	4	7.8	40	2400(1)	NO
Lead	4	7.5	42	200 (2)	NO
Mercury	4	< 0.3	< 0.3	40(1)	NO
Nickel	4	5.6	6.5	180(1)	NO
Selenium	4	< 1.0	< 1.0	250(1)	NO
Zinc	4	35	60	3700(1)	NO
pH (pH Units)	4	8.1	8.4	6-9	NO

1 LQM/CIEH – S4ULs published values (2nd Edition)
2 Defra - C4SL

The above table illustrates that whilst the Made Ground has elevated contaminants, the natural soils are generally below the appropriate SSVs. There is one exceedance of arsenic in TP123 at 0.5m which is within a stratum described as loose pale yellow-brown fine to medium SAND. TP123 is located on the south western part of the site.

6.2.2 Organics

The following tables present a summary of the organic results for the Made Ground and natural soils.

Table 6.3: Summary of Analytical Testing Results for Made Ground (PAH)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSV (mg/kg)	Exceedances (Yes / No) / Location
Naphthalene	29	< 0.05	0.74	2.3[(1)]	NO
Acenaphthylene	29	< 0.10	1.7	170[(1)]	NO
Acenaphthene	29	< 0.10	0.87	210[(1)]	NO
Fluorene	29	< 0.10	2.7	170[(1)]	NO
Phenanthrene	29	< 0.10	14	95[(1)]	NO
Anthracene	29	< 0.10	3.4	2400[(1)]	NO
Fluoranthene	29	< 0.10	25	280[(1)]	NO
Pyrene	29	< 0.10	18	620[(1)]	NO
Benzo(a)anthracene	29	< 0.10	12	7.2[(1)]	NO
Chrysene	29	< 0.05	11	15[(1)]	NO
Benzo(b)fluoranthene	29	< 0.10	9.7	2.6[(1)]	YES – BH101 (2 samples)
Benzo(k)fluoranthene	29	< 0.10	5.9	77[(1)]	NO
Benzo(a)pyrene	29	< 0.10	8.1	2.2[(1)]	YES – BH101 (2 samples)
Indeno(1,2,3-cd)pyrene	29	< 0.10	4.5	27[(1)]	NO
Dibenzo(a,h)anthracene	29	< 0.10	1.3	0.24[(1)]	YES – BH101 (2 samples) / TP133
Benzo(ghi)perylene	29	< 0.05	4.6	32[(1)]	NO

1 LQM/CIEH – S4ULs published values (2nd Edition)

The above table shows that generally the PAH compounds are below the SSVs for a residential with plant uptake, however exceedances of Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(a,h)anthracene were recorded in BH101 and Dibenzo(a,h)anthracene in TP133.

In BH101 two samples were analysed from the shallow Made Ground (0.5m and 1.0m depth). Both samples showed exceedances but the concentration within the deeper sample is lower than the shallower sample.

In both strata of BH101 and in TP133, gravels of slag are described and this could be the potential source of the elevated PAH compounds.

One made ground sample was tested for TPHCWG / BTEX but and was below the appropriate SSVs.

Table 6.4: Summary of Analytical Testing Results for Natural Ground (PAH)

Determinand	Number of Samples Tested	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	SSV (mg/kg)	Exceedances (Yes / No)
Naphthalene	4	< 0.5	< 0.5	2.3[(1)]	NO
Acenaphthylene	4	< 0.10	< 0.10	170[(1)]	NO
Acenaphthene	4	< 0.10	< 0.10	210[(1)]	NO
Fluorene	4	< 0.10	< 0.10	170[(1)]	NO
Phenanthrene	4	< 0.10	< 0.10	95[(1)]	NO
Anthracene	4	< 0.10	< 0.10	2400[(1)]	NO
Fluoranthene	4	< 0.10	< 0.10	280[(1)]	NO
Pyrene	4	< 0.10	< 0.10	620[(1)]	NO
Benzo(a)anthracene	4	< 0.10	< 0.10	7.2[(1)]	NO
Chrysene	4	< 0.05	< 0.05	15[(1)]	NO
Benzo(b)fluoranthene	4	< 0.10	< 0.10	2.6[(1)]	NO
Benzo(k)fluoranthene	4	< 0.10	< 0.10	77[(1)]	NO
Benzo(a)pyrene	4	< 0.10	< 0.10	2.2[(1)]	NO
Indeno(1,2,3-cd)pyrene	4	< 0.10	< 0.10	27[(1)]	NO
Dibenzo(a,h)anthracene	4	< 0.10	< 0.10	0.24[(1)]	NO
Benzo(ghi)perylene	4	< 0.05	< 0.05	32[(1)]	NO

1 LQM/CIEH – S4ULs published values (2nd Edition)

The table above shows that whilst exceedances were encountered in the Made Ground, no PAH compounds were above the SSVs in the natural soils.

6.3 Asbestos

All the samples were screened for asbestos fibres. Asbestos was detected in two out of 33 samples; TP133 at 0.4m (Crocidolite – loose fibres) and TP134 at 0.2m (Chrysotile – loose fibres). Both are from the Made Ground (silty sandy Gravel) and no fibres were visible during the investigation. However it is noted that rockwool fragments were identified in the demolition rubble located in TP134 at shallow depth.

It is noted that a shallower sample was analysed from TP133 (0.2m) and no asbestos fibres were detected.

6.4 Calorific Value / Loss on Ignition

Five samples from the made ground have been analysed for Loss on Ignition (LOI) and Calorific Value (CV). The samples targeted were those containing slag fragments to assess whether they could ignite under the appropriate conditions.

The loss of ignition values ranged between 0.85 and 6%, which indicates that during the analysis up to 6% of the material has been lost and could be available to combustion. As a

comparison the LOI threshold for material to be accepted at a hazardous landfill is 10%. This would indicate that the risk from the material on the site is generally low.

CV is the quantity of heat which can be released from a sample after complete combustion in excess oxygen under 30 atmosphere pressure. It is used as an initial screen to determine the potentially combustibility of material.

The results of the CV analysis ranged from 0.025 to 3.2357 MJ/kg.

It is suggested that there is an unacceptable risk of smouldering when the CV of the soil / material exceeds 7MJ/kg [20]. The samples on the site are all below this threshold with the maximum being approximately half. It is also noted that the potentially combustible material is within a soil matrix which is likely to reduce the risk of combustion.

6.5 Groundwater Risk Assessment

Groundwater samples have been collected from BH102 and BH103 during two monitoring rounds (25th March 2015 and 22nd May 2015).

Four groundwater samples were tested for a suite of contaminants including inorganic and organic contaminants to assess if there is any impact on the underlying groundwater beneath the site. The laboratory results can be found in Appendix E.

6.5.1 Water Quality Standards

To assess the groundwater in terms of its potential as a source of contamination, each contaminant concentration has been compared against appropriate Water Quality Standards (WQS). As this site is located next to the coast, the groundwater is likely to be impacted by saline water and therefore where available saline WQS have been adopted. The UK Statutory Guidance for saltwater is considered to be the most appropriate. Where no saline WQS are available for a particular contaminant then either the Environmental Quality Standards (EQS) for freshwater or UK Drinking Water Standards (DWS) will be used to provide an indication of the water quality. The saline WQS have been sourced from Environment Agency Chemical Database (http://evidence.environment-agency.gov.uk/ChemicalStandards/Home.aspx)

6.5.2 Metals and Other In-organics

All sample results were below the appropriate saline WQS with the exception of copper and selenium.

Copper was found to be elevated in both groundwater samples taken from the first monitoring round in March. Concentrations were 6.4ug/l (BH102) and 9.1ug/l (BH103) against a WQS of 5ug/l. However the samples taken from the following monitoring round both had concentrations of 2.8ug/l which are below the WQS. This indicates that the previous slightly elevated concentrations recorded are not likely to be of concern.

There were two contaminants where saline guidance values were not present; boron and selenium. For these contaminants, EQS value for boron and DWS for selenium was used.

All results for boron were below the EQS value, however the DWS value for selenium (10 ug/l) was very slightly exceeded in BH102 with a concentration of 11 ug/l on the 22nd May. Given the very minor exceedance, selenium is not considered to be a concern.

6.5.3 Hydrocarbons

Polycyclic Aromatic Hydrocarbons (PAH)

Groundwater samples were tested for speciated PAHs and all the results were below the limit of detection (10ug/l).

Total Petroleum Hydrocarbons

Groundwater samples were tested for TPH and all the results were below the limit of detection (10ug/l).

BTEX

Groundwater samples were tested for BTEX compounds and all the results were below the limit of detection.

Based on the above, hydrocarbons are not considered to be contaminants of concern.

6.6 Gas Risk Assessment

Ground gas monitoring was undertaken in 7 locations during monitoring visits undertaken on 25th March, 9th April 2015 and 22nd May 2015.

Carbon dioxide concentrations ranged from less than detection to 1.4% volume. Methane concentrations were always recorded below the limit of detection (0.1 % vol). Flow rates were below the limit of detection.

CIRIA guidance [13] has been used to inform the ground gas assessment which adopts the method proposed by Wilson and Card (Situation A) and NHBC (Situation B). For both approaches, the ground gas concentration and borehole flow rate are used to calculate a Gas Screening Value and define a Characteristic Situation (CS) (Situation A) or traffic light scenario (Situation B).

A Gas Screening Value (GSV) is calculated using the following equation:

GSV (l/h) = borehole flow rate (l/h) x ground gas concentration (v/v %)

As the flow rate has been recorded as below the limit of detection (<0.1l/h) in all boreholes during all monitoring visits, this has been used as 0.1l/h in order to calculate GSVs for both methane and carbon dioxide. Using the maximum concentrations recorded during the Hyder monitoring visits, the GSVs are as follows:

- Methane GSV = 0.0001 l/h
- CO_2 GSV = 0.0014l/h

The above indicates the gas regime on the site is considered to be Characteristic Situation (CS) 1- very low risk.

7 Conceptual Model – Contaminant Linkages

7.1 Introduction

The aim of this conceptual model and risk assessment is to provide an identification of the risks to, proposed future site users, controlled waters and the surrounding area posed by any contamination present on site. The assessment is based on identification of 'contaminant linkages', i.e. contaminant source-pathway-receptor relationships.

It should be noted that for the purposes of this report, assessment of risks relating to the current site use have not been considered. As mentioned previously in this report, the majority of the site will be residential development and therefore the assessment has been undertaken with this in mind. The sections below identify the potential receptors / pathways and contaminant sources for the proposed land use.

7.2 Contaminant Sources

Based on the chemical data currently available and the assessment against SSVs for a residential with plant uptake scenario the following determinands have been identified to be contaminants of concern;

Soils

- Inorganics – arsenic, cadmium, lead and zinc
- Organics – Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenzo(a,h)anthracene
- Asbestos;
- Ground Gases

7.3 Risk Assessment Methodology

Risk assessment is the process of collating known information on a hazard or set of hazards (to determine the potential severity of any impact) along with details on the likelihood of impact on detailed receptors. Risks are generally managed by isolating the sensitive receptor or by intercepting or interrupting the exposure pathway, thus no pollutant linkages are formed and there is no risk. The following risk assessment focuses on the potential contaminants identified on the site in the context of the proposed development of the site.

CIRIA guidance [15] states that the designation of risk is based upon a consideration of both:

- The likelihood of an event (probability); (takes into account both the presence of the hazard and the receptor and the integrity of the pathway).
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor)

Under such a classification system the following categorisation of risk has been developed and the terminology adopted as follows:

Table 7.1: Summary of Risk Classification Categories

Term	Description
Very High Risk	There is a high probability that significant harm could arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
High Risk	Significant Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate Risk	It is possible that without appropriate remedial action, harm could arise to a designated receptor but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild.
Low Risk	It is possible that significant harm could arise to a designated receptor from an identified hazard but it is likely that at worst this harm if realised would normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

7.4 Contaminant Linkages

Based on the contaminant sources and the potential receptors and pathways identified in previous sections, the following tables provides an assessment of each identified contaminant linkage to establish the potential risk to the sensitive receptors for each proposed land use.

It should be noted that risks to construction workers have not been considered within the assessment below as contamination risks to construction / site workers are not appraised by chronic (long term) exposure human health risk assessments. Site specific construction workers risk assessment and appropriate health and safety practices to adequately mitigate the potential risks are recommended for any future works. Works should be conducted in accordance with the CDM Regulations (2015) or any other relevant guidance.

During site construction works, site workers should remain vigilant to the possible risk of encountering isolated areas of contaminated soils and asbestos containing material. Should potentially contaminated material be encountered, further testing will be required to assess the risks to the health and safety of site workers and the environment.

Table 7.2: Summary of Contaminant Linkages – Residential with plant uptake scenario

CL No.	Contaminant Source	Sensitive Receptor	Pathway	Hazard (Severity)	Likelihood	Potential Risk	Comments
CL1	Inorganic contaminants (arsenic, cadmium, lead and zinc), PAH Compounds including benzo(a)pyrene (BaP), in Made Ground	Human Health	Ingestion / Inhalation / Dermal Contact / Veg uptake	Chronic damage, carcinogenic compounds (**Medium**)	**Likely** Contaminant concentrations have been found to be elevated. For a residential scenario with private gardens, a large proportion of the site would be soft landscaping and therefore it is likely that receptors would come into contact with such near surface soils if no remediation/mitigation is undertaken.	**Moderate**	Contamination has been encountered in the near surface soils. The level of remediation / mitigation required will depend on the overall design of the development but some basic cover protection is warranted, focused in soft landscaping areas.
CL2		Controlled Waters (Groundwater and Surface water)	Leaching and migration into water environment	Reduction of water quality, although unlikely to be a potable resource due to proximity of the sea. (**Mild**)	**Unlikely.** Contaminant concentrations recorded in the groundwater samples were generally below the WQS and therefore leaching of contaminants does not appear to be occurring to significant quantities	**Very Low**	
CL3		Buildings / Services	Contact of contaminants with buildings and structures (excluding potable water supply pipes)	Damage to structures (**Mild**)	**Unlikely.** Identified contaminants are unlikely to cause significant damage to buildings. .	**Very Low**	None
CL4	Asbestos	Human Health	Inhalation of fibres	Chronic damage, carcinogenic compounds (**Medium**)	**Low to Likely.** Asbestos fibres have been detected in two sample locations within the development area. These were encountered within the soil matrix. Inhalation of fibres could occur if disturbed causing a risk to site end users if left on site. Low likelihood relates to majority of sampling positions where no asbestos was encountered.	**Moderate / Low to Moderate**	Mitigation / remedial action / watching brief will be required prior to development to ensure that the risk from asbestos is mitigated. Probably basic cover system in areas of soft landscaping. It is noted that this is not a widespread issue across the site, however as fibres have been detected it is possible that asbestos is present in other locations across the site.

CL No.	Contaminant Source	Sensitive Receptor	Pathway	Hazard (Severity)	Likelihood	Potential Risk	Comments
CL5	Ground Gases	Human Health / Buildings	Asphyxiation / build up in confined spaces / explosion	Irreversible damage (**Severe**)	**Low.** Low gas concentrations / flow rates have been recorded on site to date	**Moderate**	Further gas monitoring may be required to ensure that the gas regime is appropriate.

Based on the information available, contaminant linkages have been identified. The risk to human health is considered to be moderate to high due to the elevated concentrations predominately of metal compounds, including arsenic and lead present within the made ground soils. There is also considered to be a moderate / moderate to low risk from asbestos fibres that have been detected within the soil matrix. Further characterisation may be required.

It should be noted that due to the nature of the shallow soils i.e. made ground containing slag gravel, it is unlikely to be considered suitable for planting vegetation / soft landscaped areas and therefore some form of remediation such as a cover system is likely to be required within the design of these areas.

There is a moderate risk to human health from ground gases based on the results to date.

8 Engineering Considerations

8.1 Foundations

8.1.1 Shallow Foundations

Shallow spread foundations may be suitable for low-rise development (1 to 4 storey buildings) provided foundations can be located in the Blown Sand, and where the depth of foundation is at least 0.9 m below the finished ground level. To maintain foundation capacity, the depth of foundation should where possible be set at a level that remains above the long term groundwater table by at least the effective size of the foundation; for this site the ground water is around 7 m OD, therefore foundation depths should be no lower than 8 m OD for strip footings or square footings of 1 m width. Where these conditions are met, the allowable bearing resistance of the ground should be at least 80 kPa.

The minimum thickness of Blown Sand determined by the ground investigation is 5.70 m; therefore to limit imposing significant stress on the underlying Tidal Flat Deposits, foundations size and width should be kept to a minimum and should not exceed an effective width of 2.0 m. Where larger foundation size is required, or where the foundation stress bulb will impact the Tidal Flat Deposits or groundwater table, then a detailed assessment of foundation conditions will be necessary or consideration should be given to using piled foundations.

8.1.2 Piled Foundations

For larger structures with high foundations loads conventional piled foundations end bearing in the Marine Beach Deposits or Glacial Deposits are recommended. The use of driven piles is not recommended due to the risk of disturbance to neighbouring site users or the risk of causing liquefaction of the saturated silt layers within the Tidal Flat Deposits. Cased bored piles are considered a suitable solution but the advice of a specialist piling contractor should be sought as to the most suitable solution.

Bored piles are likely to be at least 20 m long but will be capable of supporting loads in the region of 1000 kPa. Some allowance for negative skin friction developed in the Tidal Flat Deposits may be required depending on the final levels adopted at the site.

An alternate solution to deep bored concrete piles may be the use of a screw-pile foundation. Screw piled foundations are relatively easy and rapidly installed and because they are installed with little ground disturbance can develop comparatively high load capacity in poor ground conditions. The foundation option is also highly attractive in terms of sustainability as the systems permits comparatively easy removal and the steel can be recycled.

8.1.3 Reuse of Existing Foundations

The former Lido building was supported on a piled foundation. The construction details of the piles is unknown and therefore the capacity for reuse of the existing foundation solution remains unknown. In order to consider the existing piles for reuse the following actions are recommended:

- A specific foundation resuse desk study is undertaken to validate the existing pile properties,
- A test programme is established to determine any pile defects using non-destructive methods,

- assessment of any material deterioration,
- the load-bearing capacity of the piles is established either by reverse calculation and/or pile capacity testing.

In addition, the design of the new superstructure will need to adopt a resuse philosophy which will require a series of mitigation methods including:

- design of a robust superstructure to reduce the impacts of a single pile failure,
- adoption of an appropriate level of caution applied to the reuse load-carrying capacity,
- consideration of a partial reuse scheme with a robust foundation design.

8.2 Temporary works

8.2.1 Excavation stability

During the ground investigation a number trial pits were found to be unstable at comparatively shallow depth and at levels above the groundwater table. It is therefore expected that all excavations on site will likely require careful consideration from a stability point of view and will likely require some form of immediate support.

8.2.2 Dewatering

It is unlikely that dewatering of excavations will be required for conventional shallow foundation. However, should deep excavations extending below 7 m OD be required then dewatering will be required. A well pointing system is recommended to prevent fine sands and silts from blowing and causing significant stability issues. Settlement resulting from any dewatering processes will require careful planning to determine the effects on adjacent structures and the settlement of the soils beneath the site.

9 Geotechnical Risk Register

A geotechnical risk register is presented in Table 9.1 below to identify possible residual geotechnical risks that may be present on site, occur during the design and/or development of the site

Table 9.1: Geotechnical Risk Register

Hazard	Consequence	Likelihood	Severity	Risk	Mitigation Measures
Laterally variable ground conditions (including sudden lateral changes in ground conditions) The ground investigation to date has been exploratory. Other ground conditions are likely to be encountered that have not been revealed by this ground investigation.	Ground conditions weaker than anticipated causing structural damage to buildings Differential settlement In sufficient bearing capacity Structural damage to buildings	Medium	High	High	Once the proposed development of the site has been confirmed, a main ground investigation should be commissioned to confirm the ground conditions. Reinforced concrete foundations are recommended to minimise the risk of differential settlement of foundations over
Unstable excavations - unsupported excavations are indicated to be unstable	Programme delays Injury or death of workers Damage to plant and equipment Damage to corporate reputation	High	High	High	Allowance should be made for the use of adequate excavation supports during the planning and development of the site
Settlement of buildings on shallow foundations in excess of tolerance	Differential settlement Damage to services Structural damage	High	High	High	Bearing and settlement checks should be undertaken during the design phase for the preferred foundation solutions.
Foundation positions corresponding with trial pit locations	Localised differential settlement of foundations Structural damage	High	Medium	High	The positions of trial pits should be noted during the design phase. Allowance should be made to remove any disturbed materials present beneath founding depth and replacement with a suitable compactable fill material. Reinforced foundations are recommended to minimise local differential settlement.
High Ground Water Levels – Some ground water monitoring has been carried out, but unlikely to indicate worst case conditions.	In sufficient bearing capacity of foundations Blowing of sands beneath groundwater level causing	Low	High	Medium	Further groundwater monitoring is recommended to determine the worst case ground water conditions and determine whether the groundwater is tidal.

Hazard	Consequence	Likelihood	Severity	Risk	Mitigation Measures
Obstructions in the ground – The foundations to the historical buildings may be present with the ground.	Differential settlement from proposed foundations straddling historical foundations. Programme delays arising from the need to remove existing foundations. Obstructions for further investigations.	High	Medium	High	Adopt a reuse design policy for existing piled foundations or existing foundations should be removed and the resulting excavations backfilled with a suitable compactable granular fill.
Contaminated land – Pollution linkages are indicated to exist	Ill health or death of site end users and/or construction workers Damage to corporate reputation	High	Low	Medium	See Table 7.2

10 REFERENCES

1 Argyll Environmental. 2014. Sitecheck Assess Report for land at Princess Way Port Talbot. Report SAS_58455219_1_1. Landmark Group. 2014

2 British Geological Survey. 2011. Swansea. England and Wales Sheet 247. Bedrock and Superficial Deposits. 1:50 000 scale map. BGS, Keyworth, Nottingham.

3 British Geological Survey. Onshore GeoIndex website. Accessed May 2015.

4 British Standards Institution (BSi). BS5930:1999+A2:2010 Code of Practice for Site Investigations. BSi, London.

5 British Standards Institution (BSi). BS10175:2011 Investigation of Potentially Contaminated Sites: Code of Practice

6 British Standards Institution (BSi). 2002. BS EN ISO 14688-1:2002 Geotechnical investigation and testing – Identification and Classification of soil – Part 1: Identification and description. BSi, London.

7 British Standards Institution (BSi), 2004. BS EN ISO 14688-2:2004 Geotechnical investigation and testing – Identification and Classification of soil – Part 2: Principles for a classification. BSi, London.

8 British Standards Institution (BSi), 2006. BS EN ISO 22475-1:2006 Ground Investigation and Testing – Sampling Methods and Groundwater Measurements. BSi, London.

9 British Standards Institution (BSi), 2005. BS EN ISO 22476-2:2005 Geotechnical Investigation and Testing – Field Testing. BSi. London.

10 British Standards Institution (BSi), (1990). BS1377:1990 Parts 1 - 8 Methods of Test for Soils for Civil Engineering Purposes. BSi, London.

11 British Standards Institution (BSi). (1990). BS1377:1990+A2:2007 Part 9 - Methods of Test for Soils for Civil Engineering Purposes – *In Situ* Tests. BSi, London.

12 British Standards Institution (BSi). BS 8576 2013 Guidance on Ground Investigations for Ground Gas

13 BRE Special Digest (2005). Concrete in aggressive ground, Special Digest 1:2005, 3rd Edition, The Concrete Centre, BRE Construction Division.

14 CIRIA C665, 2006. *Assessing risk posed by hazardous gases to buildings*

15 CIRIA guidance C552

16 Coal Authority. 2013. Non-residential Ground Stability Report on coalfield – Afan Lido, Princess Margaret Way Port Talbot. Coal Authority/BGS.

17 Environment Agency (EA) Groundwater Map [Website]

18 Environment Agency Contaminated Land Exposure Assessment (CLEA) software v1.06

19 Defra (2014) SP1010 Development of Category 4 Screening Levels for assessment of land affected by contamination. Project Report and Policy Companion Document

20 ICRCL (1986) Notes on the fire hazards of contaminated land (Guidance Note 61/84)

21 Goundsure. 2013. EnviroInsight Report CMAPS-CM-256601-18278-100913EDR.

22 LQM / CIEM (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment

23 Port Talbot Historic Society. Web pages http://www.historicalporttalbot.com/

24 Transport Research Laboratory (TRL). 2004. PR INT 277-04 Dynamic cone penetrometer test and analysis. TRL, Crowthorne.

Figures



Figure 1. Site Location

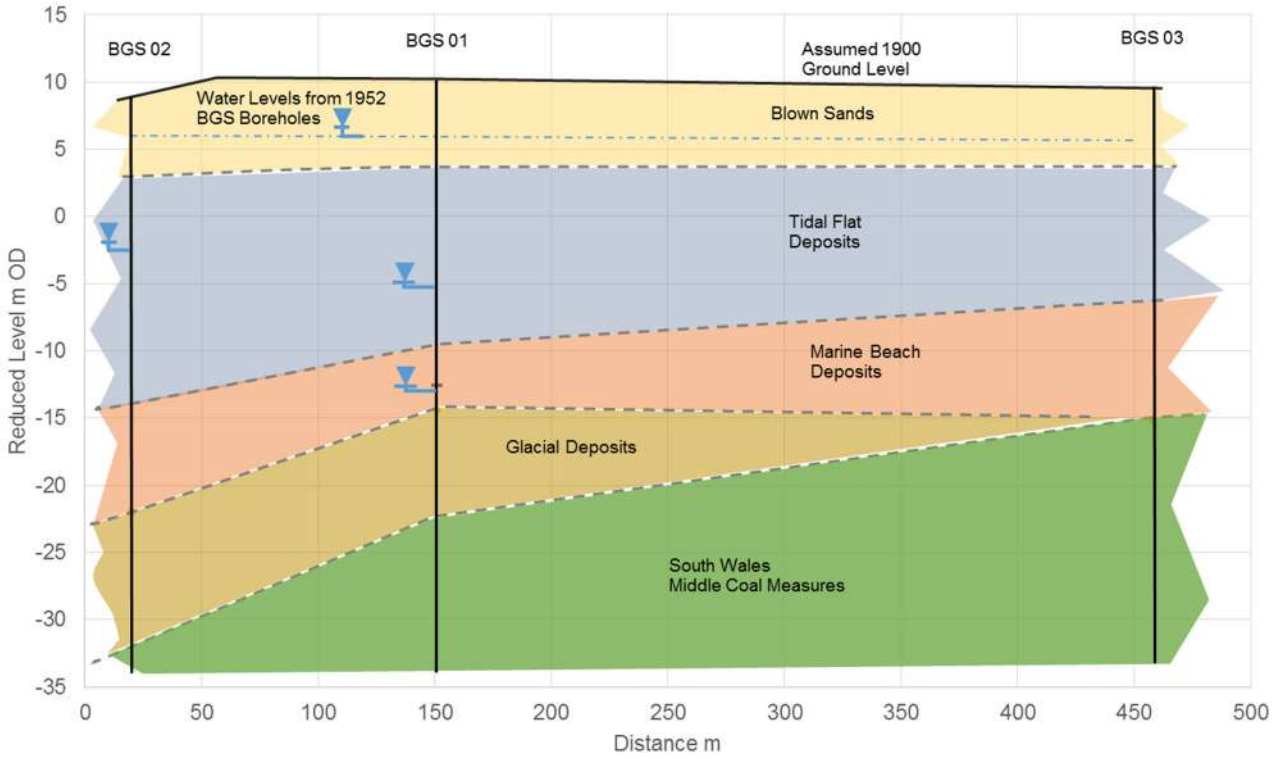


Figure 2 Geological Section from Historic Borehole Information

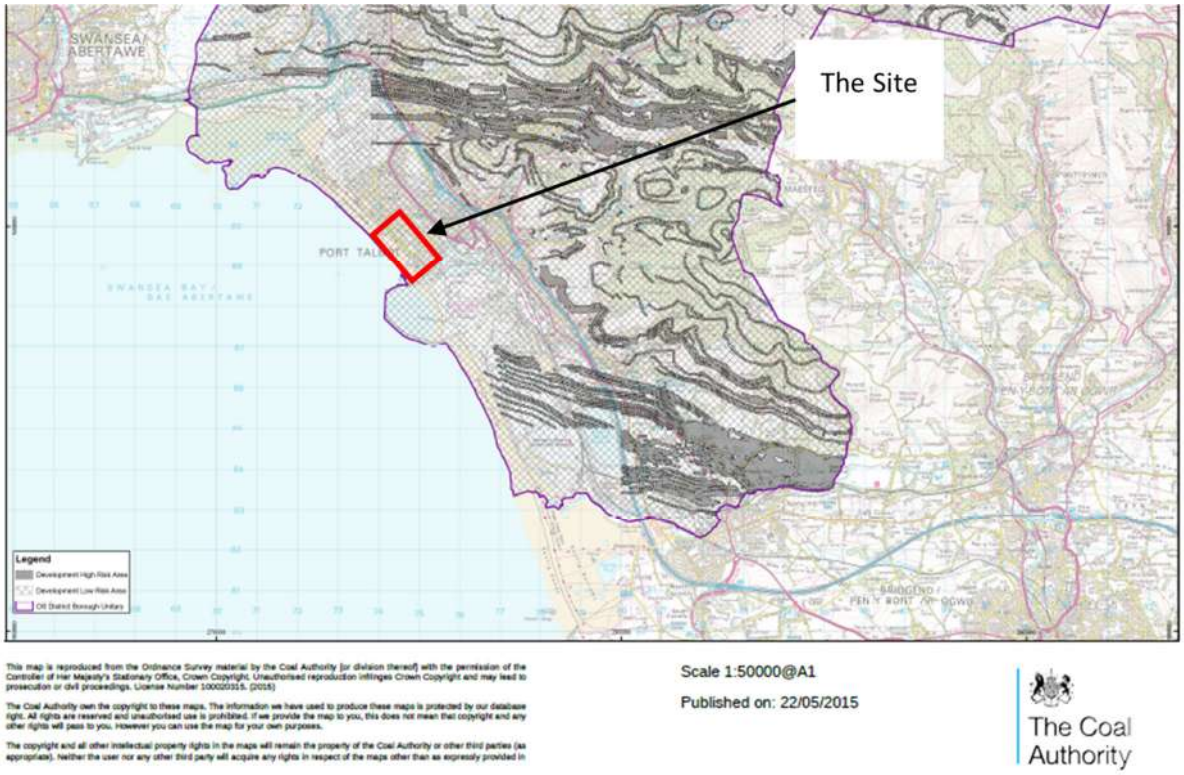
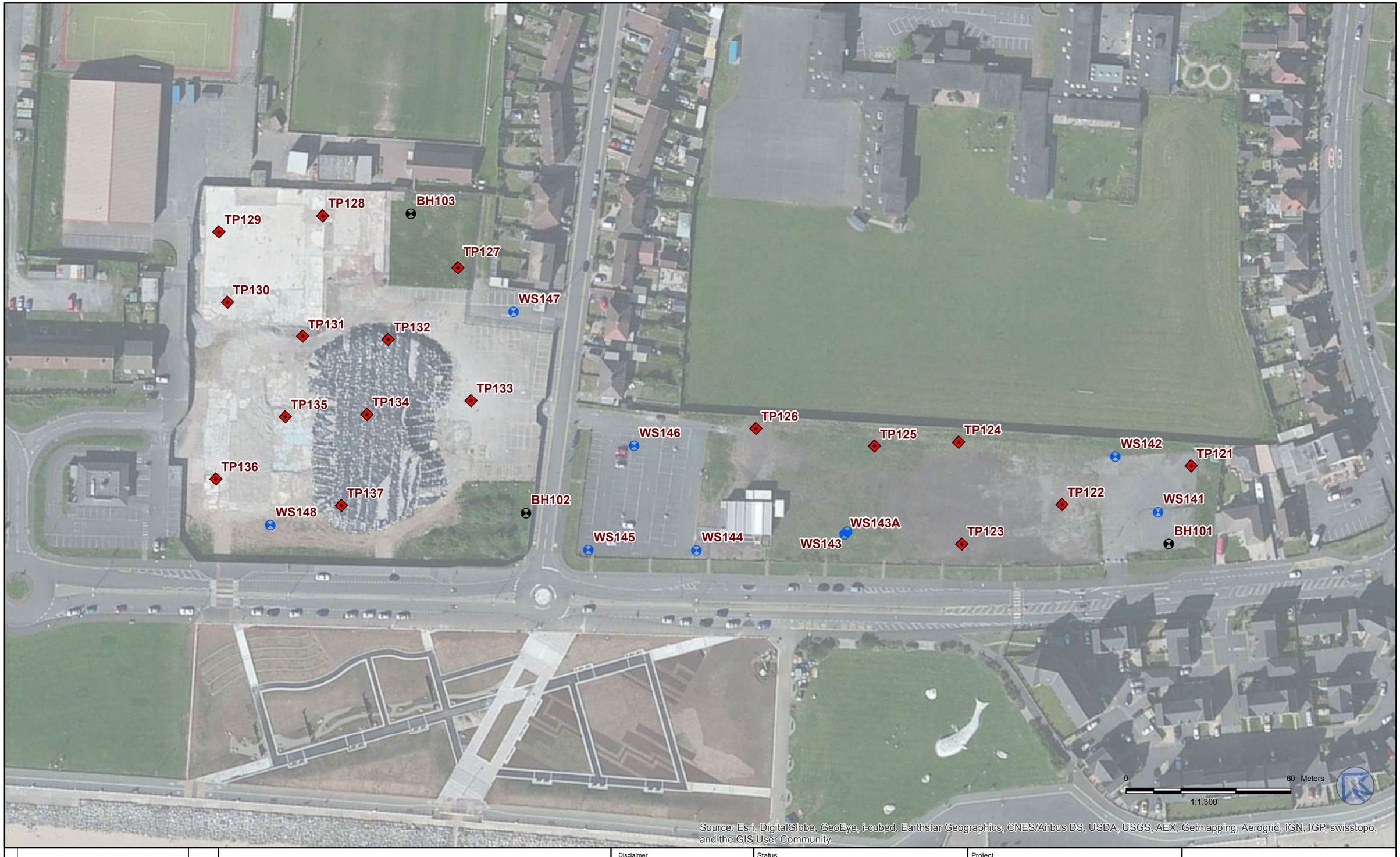


Figure 3 Part of Coal Authority Development Risk Map for Neath Port Talbot

Figure 4 Exploratory Hole Plan



Issue	Description	Date
01	VERSION 1	20/03/2015

Legend

- As built CP
- As built TP
- As built WS

Disclaimer

© Crown copyright and database rights 2015

Status: PRELIMINARY/CONFIDENTIAL

		Current Issue Signatures	
Scale	1:1,300	Drawn S.R	
Original Size	A3	Checked M.G	
Height Datum	NEWLYN	Approved G.W.	
Grid	O.S	© Copyright reserved	
Filename:	0101-UA007442-01-Exploratory Hole Location Plan		

Project: Afon Lido

Title: As Built Exploratory Hole Location Plan

Hyder

Drawing No.	Project No.	Issue
0101	UA007442	01

50mm on Original

Date: 20/03/2015 13:51:40 Path: \\hc-ukr-wx-fs-04\wx_proj\UAprojects\UA007442 - Neath Port Talbot CBC SI Framework\001 - Afon Lido\D-Calcs\GIS\As Built Exploratory Hole location plan\0101-UA007442-01-Exploratory Hole Location Plan.mxd

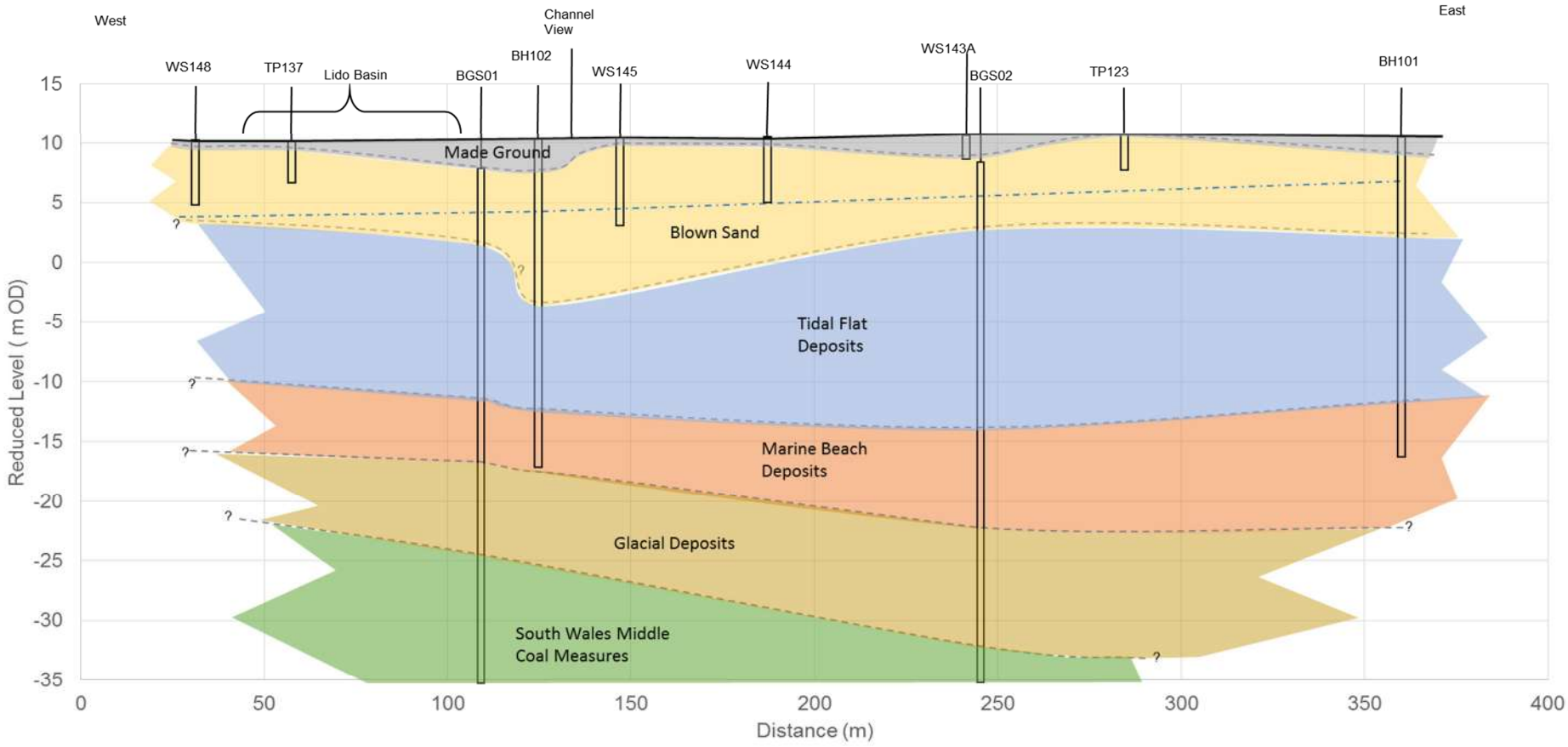


Figure 5. Geological Cross Section for Afan Lido Site

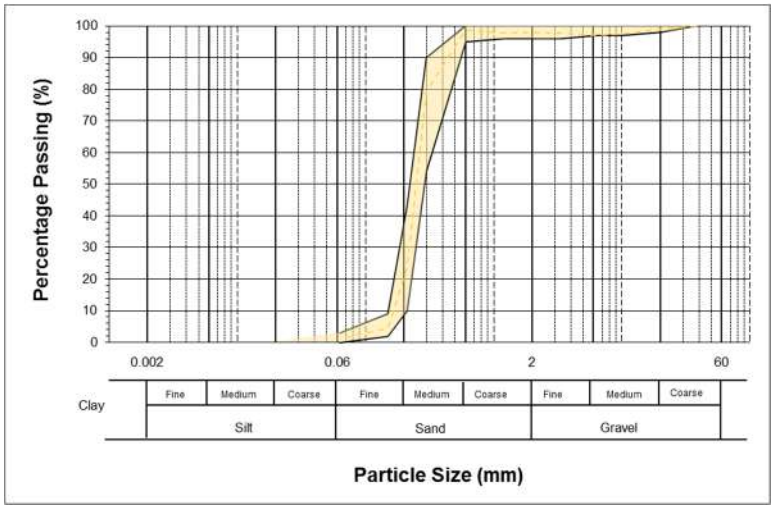


Figure 6a Particle Size Distribution – Blown Sand

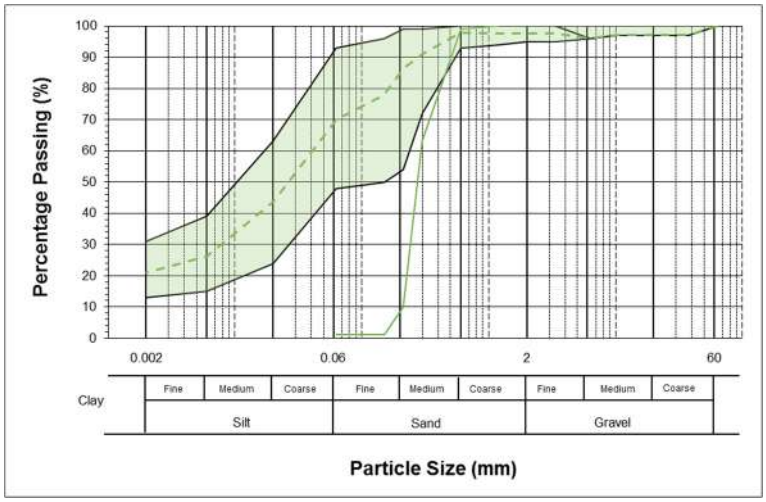


Figure 6b Particle Size Distribution – Tidal Flat Deposits

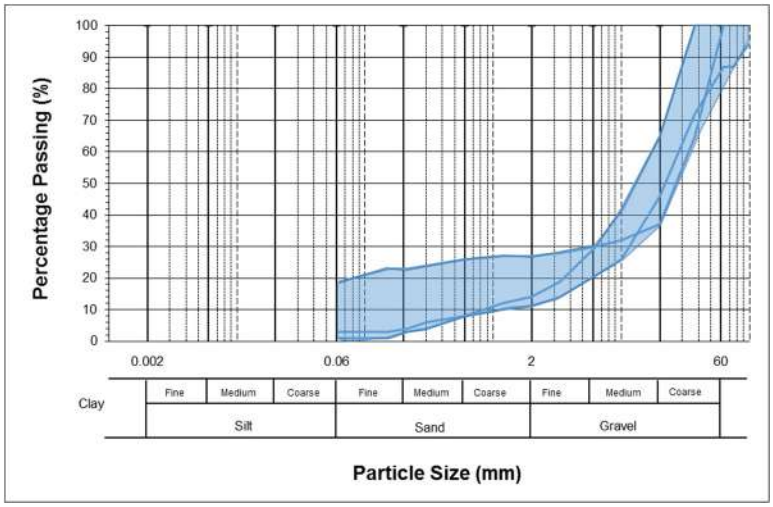
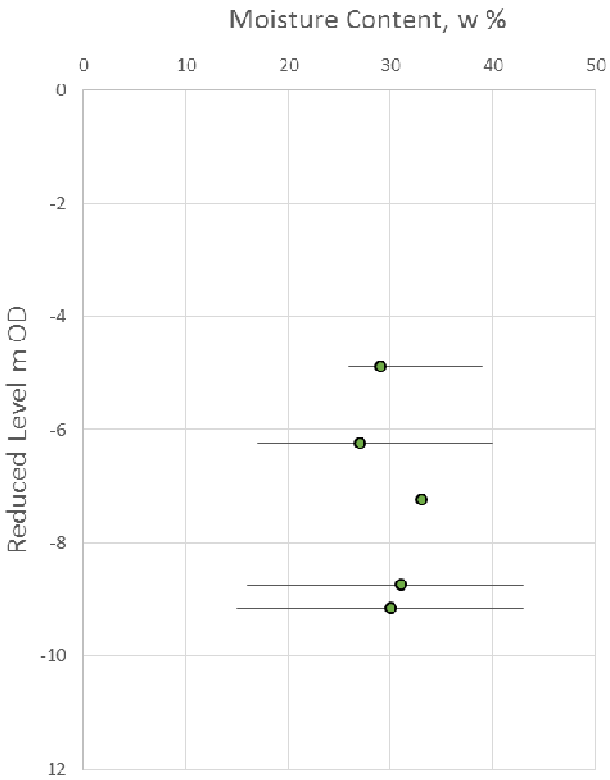


Figure 6b Particle Size Distribution – Marine Beach Deposits

Figure 6. Summary Particle Size Distributions



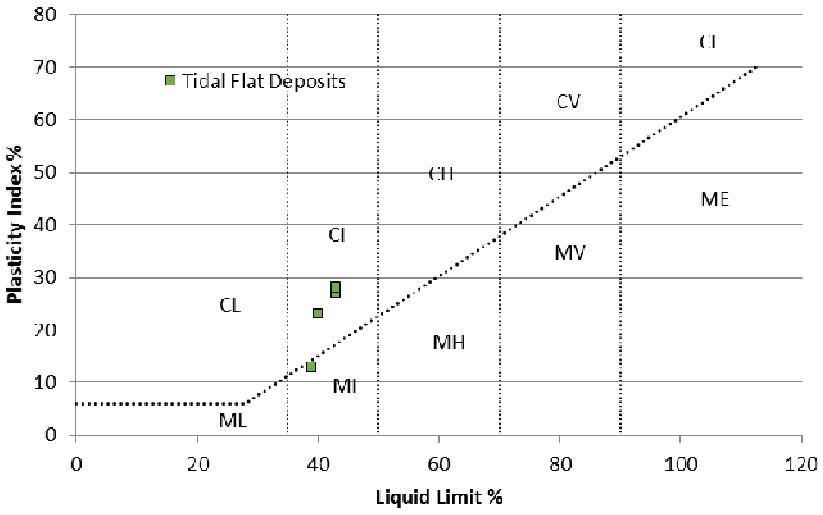


Figure 7. Summary of Classification tests for Tidal Flat Deposits

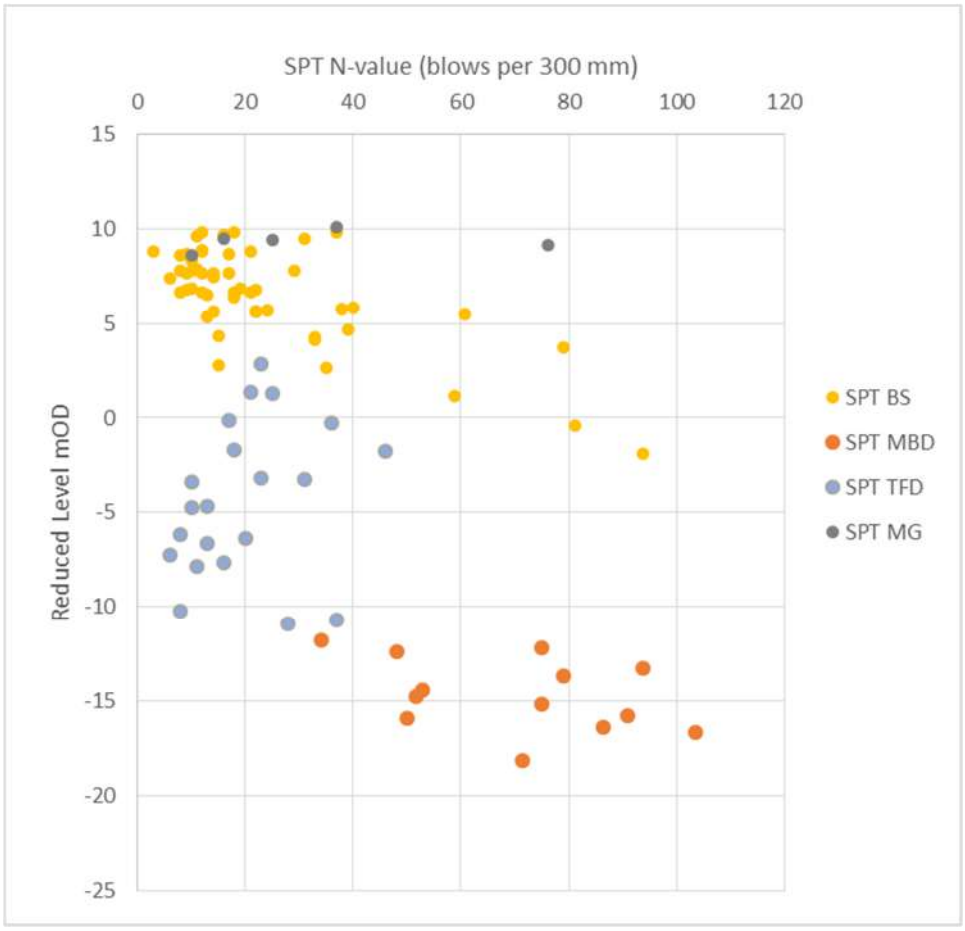


Figure 8. Standard Penetration Tests

Appendix A

Standard Procedures

Investigative Procedures

A.0 General

All ground investigation field work was carried out in general accordance with the recommendations of BS5930:1999+A2:2010 'Code of Practice for Site Investigation' [4] and BS10175 'Investigation of Potentially Contaminated Sites: Code of Practice' [5].

A.1 Routine Sampling

Representative bulk samples, disturbed and undisturbed samples of all strata encountered were recovered as part of the works. These samples were taken in line with the recommendations of BS5930:1999+A2:2010 'Code of Practice for Site Investigation' [4] and are stored in sealed plastic bags, tubs and liners following logging by a suitable Geotechnical Engineer ahead of laboratory testing.

A HCL Geotechnical Engineer logged all exploratory holes in accordance with the recommended procedures in accordance with EN 1997-2:2007 Eurocode 7, provided within:

- BS EN ISO 14688-1:2002 Geotechnical investigation and testing – Identification and Classification of soil – Part 1: Identification and Description [6]; and

- BS EN ISO 14688-2:2004 Geotechnical investigation and testing – Identification and Classification of soil – Part 2: Principles for a classification [7].

This International Standard partially supersedes document BS5930:1999+A2:2010 "Code of Practice for Site Investigations".

A.2 *In Situ* Geotechnical Testing

All *in situ* testing was carried out in accordance with BS EN ISO22475-1:2006 Geotechnical investigation and testing - Sampling methods and groundwater measurements [8], EN ISO22476-2:2005 Geotechnical Investigation and Testing – Field Testing [9] and TRRL PN INT277-04 Dynamic Cone Penetrometer Test and Analysis [24].

A.3 Groundwater

Where groundwater was encountered, measurements and samples were taken in accordance with BS EN ISO22475-1:2006 Geotechnical investigation and testing - Sampling methods and groundwater measurements [8].

A.4 Land Gases

Land gas monitoring was undertaken in accordance with BS 8576 : 2013 - Guidance on Ground Investigations for Ground Gas [15].

The concentrations of the land gases methane, carbon dioxide, carbon monoxide and hydrogen sulphide were measured using a fully calibrated gas monitor.

A.5 Buried Services

Service clearance was undertaken in accordance with HCL's common operating practice COP SA1. This document details the methods and safe working practices used to undertake excavations safely. Prior to breaking ground, services plans were consulted and the area scanned using a Cable Avoidance Tool (CAT) with detected signals marked on the ground. For all investigation positions, other than for machine excavated trial pits, hand excavated inspection pits are completed to 1.20mbgl prior to the use of drilling and boring plant.

Appendix B

Exploratory Hole Logs

LogISIS EXPLORATORY HOLE DATA SHEET 09/07/2012 10:54:20

Exploratory Hole Data Sheet

SAMPLE TYPES

B	Bulk disturbed sample	ES	Environmental soil sample	SPT	SPT split spoon sample
C	Core sample	EW	Environmental water sample	U	Undisturbed sample
CBR	Disturbed sample from CBR test area	G	Gas sample	UT	Undisturbed thin wall sample
D	Small disturbed sample	L	Liner sample	W	Water sample

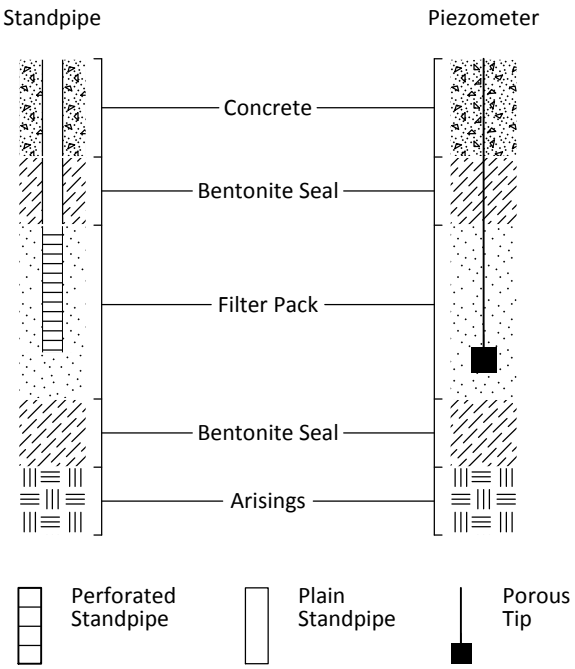
IN-SITU TESTING

SPTs	Standard Pentration Test (using a split spoon sampler) *
SPTc	Standard Pentration Test (using a solid 60 degree cone) *
N	Recorded SPT 'N' Value
-/-	Blows/Pentration (mm) after seating blows totaling 150mm
MX	Mexi Probe Test (records CBR % value)
HV	Hand Shear Vane test (undrained shear strength quoted in kPa)
PP	Pocket Penetrometer test (kg/m^3)
( )	Denotes residual test value
PID	Photo Ionisation Detector (ppm)
Kf / Kr	Permeability Test (f = falling head, r = rising head)
HPD	High Pressure Dilatometer Test (pressure meter)
PKR	Packer / Lugeon Permeability Test
CBR	California bearing ratio test

ROTARY CORE DETAILS

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation (% of intact core >100mm)
IF	Fracture Spacing (average fracture spacing; in mm, over indicated length of core) **
NI	Non-Intact core

INSTALLATION & BACKFILL DETAILS



GROUNDWATER

- Groundwater strike; 1st, 2nd etc (number denotes strike order)
- Standing water level after 20 minutes; 1st, 2nd etc (number denotes level order)
- Seepage

STRATUM BOUNDARIES

- Unit boundary
- Estimated unit boundary
- Graduated unit boundary

STRATA LEGENDS - Note: Composite strata types are shown by combining symbols

Made Ground	Silt	Peat	Limestone
Concrete	Sand	Void	Chalk
Tarmacadam	Gravel	Mudstone	Coal
Topsoil	Cobbles	Siltstone	Metamorphic rock
Clay	Boulders	Sandstone	Igneous rock

* Where a single value is quoted this is the 'N' value for a complete test signifying 300mm of pentration following a seating drive of 150mm. Where this full pentration is not achieved the number of blows is quoted for the penetration below the test total of 300mm, e.g.: 50/75.
Where total pentration is less than the seating driving this is indicated by the prefix '+' and the number of blows for total pentration, e.g.: +50/75.

** Where spacing varies significantly, the minimum, average and maximum are shown

Percussive Borehole Log

BH101

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.76**	**16-02-15**	**1 of 3**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274814.5**	**189312.1**	**23-02-15**	**1:50**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	PROGRESS Date Time	PROGRESS Casing Water	STRATA Description	Legend	Depth, Level (thickness)	Install/ Backfill
0.20	ES							BLACK BITUMINOUS PAVING		10.70	
								MADE GROUND: Pink brown slightly sandy GRAVEL of fine to medium angular limestone (type 1 sub-base).		0.06 10.66	
0.50	ES							MADE GROUND: Grey slightly silty sandy GRAVEL of fine to medium irregular aerated slag.		0.10 10.62 (0.76)	
								MADE GROUND: Pale brown locally grey-brown gravelly fine to medium SAND with low cobble and boulder content. Gravel is subrounded sandstone and aerated slag, cobbles and boulders are half bricks and blocky sandstone fragments.		0.14 0.90 9.86	
1.00	ES										
1.00-1.20	B1										
		1.30	SPTs	N=16	dry			MADE GROUND: Medium dense dark slightly silty fine to medium SAND with moderate hydrocarbon odour. Drillers report gravel size fragments of demolition rubble.		(0.70) 1.60 9.16	
1.90-2.20	ES							Loose to medium dense pale brown slightly silty fine medium SAND. Rare coarse gravel and cobble size subangular sandstone fragments. No evidence of contamination from overlying layer. (BLOWN SAND)			
1.90-2.20	B3	2.00	SPTs	N=3	dry						
		2.45	SPTs	N=8*	dry			2.00 - 4.00 Becoming loose, slightly silty to silty sand towards 2.00 m depth with closely spaced thin yellow-brown fine to coarse sand lenses.			
2.90-3.20	B5										
		3.00	SPTs	N=10	dry					(3.30)	
3.90-4.20	B7				1						
		4.00	SPTs	N=9	3.9						
					1						
4.90-5.20	B9									4.90 5.86	
		5.00	SPTs	N=38	4.4			Dense pale brown slighltly silty fine to medium SAND. Locally with rare gravel (possibly cavings from above). (BLOWN SAND)			
								4.90 - 7.50 Rare coarse gravel size aerated low density irregular slag/clinker embedded in sand between 4.90m and 5.20m depth.			
								Rare coarse sand fine gravel size slag/clinker fragments continue from 5.20m to 7.50m depth. Sand is dense over this depth range			
6.30-6.60	B11									(2.60)	
		6.50	SPTs	N=33	4.7						
						16/02/2015 17:00	7.50 4.70			7.50 3.26	
						17/02/2015 08:00	7.50 4.00	Loose pale brown silty fine to medium SAND. (BLOWN SAND).			
7.90-8.20	B13									(0.80)	
		8.00	SPTs	N=15	6.7						
8.30-8.60	B15									8.30 2.46	
								Interbedded soft green-grey silty CLAY and medium dense locally pale brown mottled silty fine to medium and locally coarse SAND. Rare fine gravel size subrounded elongate mudstone. Closely spaced horizons up to 50 to 150 mm thick of soft blue to green-grey slightly organic silty clay containing rare decomposed thin roots. (TIDAL FLAT DEPOSITS).			
9.40-9.60	B16										
		9.50	SPTs	N=25	9.1						

DRILLING TECHNIQUE From	To	Technique	CHISELLING Hard Strata From	To	Time	WATER OBSERVATIONS Date/Time	Strike At	Rise To	Casing	Sealed	HOLE/CASING DIAMETER Hole Dia.	Depth	Casing Dia.	Depth	WATER ADDED From	To	Volume (ltr)
0.00	1.00	Inspection Pit	22.50	24.00	2:00	16/02/2015 12:00	4.50	4.00	3.90	n/s	200	13.50	200	13.50			
1.00	26.82	Cable Percussion	24.00	25.45	6:00						150	26.82	150	26.50			

Remarks

BH completed at 26.82 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 26.82m

HCL House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:24

Percussive Borehole Log

BH101

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.76**	**16-02-15**	**2 of 3**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274814.5**	**189312.1**	**23-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	**Casing** *Water*	Description	Legend	**Depth**, *Level* (thickness)	
								Interbedded soft green-grey silty CLAY and medium dense locally pale brown mottled silty fine to medium and locally coarse SAND. Rare fine gravel size subrounded elongate mudstone. Closely spaced horizons up to 50 to 150 mm thick of soft blue to green-grey slightly organic silty clay containing rare decomposed thin roots. (TIDAL FLAT DEPOSITS). *(continued)*		(3.40)	
10.90-11.20	B18										
		11.00	SPTs	N=36	8.4			11.00 - 11.70 Becoming dense towards 11.00m depth			
										11.70 *-0.94*	
								Dense mid-brown and locally green-grey mottled silty fine/medium SAND. Occasional fine to coarse gravel size shells and shell fragments. (TIDAL FLAT DEPOSITS).			
12.40-12.70	B20										
		12.50	SPTs	N=46	8.6						
13.30-14.10	B22					18/02/2015 08:00	**13.50** *4.60*			(3.90)	
		14.00	SPTs	N=31	6.6			13.80 - 15.50 Occasional lenses up to 10 mm thick of soft green-grey slightly organic silty clay below 13.80m depth			
15.00-15.30	B24					19/02/2015 08:00	**15.00** *4.20*				
		15.50	SPTs	N=10						**15.60** *-4.84*	
								Loose to medium dense green-grey very silty fine SAND with very closely spaced horizons of soft green-grey and dark grey mottled slightly organic silty clay. Clay generally thinly bedded (<200mm), occasionally up to 300 mm. (TIDAL FLAT DEPOSITS).		(2.40)	
17.00-17.45	UT26			18blows							
17.40-17.80	B28	17.40	SPTs	N=13							
18.00-18.70	B30									**18.00** *-7.24*	
		18.00	SPTs	N=6				Soft to firm green-grey slightly organic silty CLAY with very closely spaced lenses of peaty organic silt up to 5mm thick and pale mid grey sandy silt and silty fine sand horizons. Green grey organic silty clay horizons becoming dominant towards 21.00m depth. (TIDAL FLAT DEPOSITS)			
		18.45	SPTs	N=9*							
19.50-19.95	UT31			9blows						(3.00)	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)

Remarks

BH completed at 26.82 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 26.82m

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:24

Percussive Borehole Log

BH101

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.76**	**16-02-15**	**3 of 3**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274814.5**	**189312.1**	**23-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	**Casing** *Water*	Description	Legend	**Depth**, *Level* (thickness)	
								Soft to firm green-grey slightly organic silty CLAY with very closely spaced lenses of peaty organic silt up to 5mm thick and pale mid grey sandy silt and silty fine sand horizons. Green grey organic silty clay horizons becoming dominant towards 21.00m depth. (TIDAL FLAT DEPOSITS) *(continued)*			
21.00-21.30	B33	21.00	SPTs	N=8		20/02/2015 08:00	**21.30** *4.30*			**21.00** *-10.24*	
		21.45	SPTs	N=9*				Soft to firm grey slightly organic clayey SILT with very closely spaced partings containing dark-brown organic speckling and occasional decomposed thin roots surrounded by dark grey discolouration. (TIDAL FLAT DEPOSITS)		(0.80)	
21.90-22.30	B34									**21.80** *-11.04*	
								Soft green-grey and brown mottled organic clayey SILT with very closely spaced sandy silt horizons and dark brown organic peaty fragments. (TIDAL FLAT DEPOSITS)		(0.60)	
22.40-22.60	B36									**22.40** *-11.64*	
		22.50	SPTc	N=34				Dense grey clayey sandy GRAVEL with low cobble content. Gravel and cobbles are subangular to rounded often flat to tabular sandstone. (MARINE BEACH DEPOSIT)		(1.40)	
23.80-24.10	B38									**23.80** *-13.04*	
		24.00	SPTc	N=50/160				Very dense grey and grey brown silty very sandy GRAVEL with medium-high cobble content. Gravel and cobbles are subrounded to subangular locally flat to tabular to elongate sandstone, upto 0.15m in size where visible in returns. (MARINE BEACH DEPOSIT))			
25.40-25.60	B39					23/02/2015 08:00	**25.45** *4.20*			(3.02)	
		25.50	SPTc	N=50/290							
26.30-26.50	B41										
		26.50	SPTc	N=50/165							
						23/02/2015 10:00	**26.50**	**End of Exploratory Hole**		**26.82** *-16.06*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)

Remarks

BH completed at 26.82 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 26.82m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:25

Percussive Borehole Log

BH102

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.62**	**23-02-15**	**1 of 3**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274663.0**	**189491.1**	**02-03-15**	**1:50**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	PROGRESS Date Time	PROGRESS Casing / Water	STRATA Description	Legend	Depth, Level (thickness)	Install/ Backfill
								Grass over TOPSOIL comprising brown slightly gravelly CLAY and SILT with frequent-thin roots. Gravel is fine to medium subangular sandstone.		10.46	
										0.16 (0.40)	
								MADE GROUND: Soft slightly moist grey brown slightly sandy slightly gravelly CLAY AND SILT with occasional thin roots in upper part (to 0.40m depth). Gravel is fine to coarse subangular flat to elongate sandstone and rare brick.		**0.56** 10.06	
0.90-1.10	B1									(0.44)	
1.10-1.30	B2							MADE GROUND: Firm grey-brown and orange brown mottled slightly sandy slightly gravelly CLAY AND SILT with occasional thin roots in upper part (to 0.40m depth) Gravel is fine to coarse subangular limestone and sandstone with medium cobble content of angular flat to irregular limestone up to 0.20m in size below 0.70m depth.		**1.00** 9.62	
1.20-1.65	D3	1.20	SPTs	N=25	dry	24/02/2015 17:00	**1.40** *dry*			**1.20** 9.42	
						25/02/2015 08:00		MADE GROUND: Medium dense brown and grey-brown very silty gravelly SAND with low cobble content. Silt and sand are predominantly reworked natural soil with occasional dark grey ash inclusions. Gravel and cobbles are subrounded sandstone, irregular slag and clinker and occasional coal fragments. Old broken plastic container and occasional plant remains.		**1.40** 9.22	
1.90-2.30	B4										
2.00-2.45	D5	2.00	SPTs	N=10				MADE GROUND: Loose pale brown/orange-brown locally slightly silty fine/medium SAND with rare fine gravel size subangular flat mudstone fragments surrounded by dark grey discolouration.		(1.50)	
								MADE GROUND: Loose pale brown and locally pale grey-brown slightly silty fine to medium SAND. Single gravel size glass and pottery fragments embedded in SPT spoon sample at 2.00-2.45m depth.			
2.90-3.20	B6									**2.90** 7.72	
3.00-3.45	D7	3.00	SPTs	N=12				Medium dense pale brown slightly silty fine/medium SAND with closely spaced weakly cemented horizons up to 30mm thick. Rare coarse sand-fine gravel size angular flat dark grey mudstone and shell fragments. (BLOWN SAND).			
3.90-4.30	B8										
4.00-4.45	D9	4.00	SPTs	N=12							
4.90-5.20	B10									(3.60)	
5.00-5.45	D11	5.00	SPTs	N=14							
6.20-6.60	B12				1						
6.50-6.95	D13	6.50	SPTs	N=33						**6.50** 4.12	
								Dense pale brown and orange-brown slightly silty fine to medium and locally coarse SAND with occasional grey-brown mottling and irregular silty veining. Rare fine to medium subangular flat mudstone gravel (BLOWN SAND).			
7.90-8.20	B14										
8.00-8.45	D15	8.00	SPTs	N=35						(3.00)	
9.40-9.65	B16										
9.50-9.95	D17	9.50	SPTs	N=50/255						**9.50** 1.12	
								Very dense pale brown slightly fine-coarse SAND with occasional fine to medium gravel size partially decomposed layers and shell fragments. (BLOWN SAND).			

DRILLING TECHNIQUE

From	To	Technique
0.00	1.20	
1.20	27.45	

CHISELLING

Hard Strata From	Hard Strata To	Time
24.00	26.50	6:00
26.50	27.00	2:00

WATER OBSERVATIONS

Date/Time	Strike At	Rise To	Casing	Sealed
25/02/2015 10:30	6.20	6.00	6.00	n/s

HOLE/CASING DIAMETER

Hole Dia.	Depth	Casing Dia.	Depth
200	13.50	200	13.50
150	27.00	150	27.00

WATER ADDED

From	To	Volume (ltr)

Remarks

BH completed at 27.45 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 27.45m

Percussive Borehole Log

BH102

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.62**	**23-02-15**	**2 of 3**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274663.0**	**189491.1**	**02-03-15**	**1:50**

SAMPLES		TESTS			Water Strikes	PROGRESS	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Date / Time — Casing / Water	Description	Legend	**Depth**, *Level* (thickness)	
10.90-11.20	B18						Very dense pale brown slightly fine-coarse SAND with occasional fine to medium gravel size partially decomposed layers and shell fragments. (BLOWN SAND). *(continued)*		(4.30)	
11.00-11.45	D19	11.00	SPTs	N=50/185						
12.40-12.70	B20									
12.50-12.95	D21	12.50	SPTs	N=50/160		25/02/2015 17:00 **12.70** 26/02/2015 08:00 **12.70** *6.30*				
13.80-14.20	B22								**13.80** *-3.18*	
14.00-14.45	D23	14.00	SPTs	N=10			Thickly interlaminated soft to firm green-grey and occasionally dark grey mottled slightly organic silty CLAY AND loose-medium dense green grey-brown silty fine to coarse SAND containing occasional fine gravel size shell fragments. Clay horizons appear to be dominant constituent and up to 0.10m thickness. (TIDAL FLAT DEPOSITS)		(1.90)	
15.50-15.95	UT24			26blows					**15.70** *-5.08*	
16.90-17.20	B25						Firm green-grey organic sandy (fine) clayey SILT with extremely closely spaced silty sand horizons, closely spaced black peaty veins up to 5mm thick, occasional dark grey mottling and rare decomposed thin roots. (TIDAL FLAT DEPOSITS).		(2.80)	
17.00-17.45	D26	17.00	SPTs	N=20						
18.30-18.60	B27									
18.50-18.95	D28	18.50	SPTs	N=11					**18.50** *-7.88*	
19.90-20.20	B29						Soft to firm grey and grey-brown slightly organic slightly sandy (fine) SILT with extremely closely spaced thin (<10m) horizons green-grey silty fine sand. Extensively disturbed by drilling. (TIDAL FLAT DEPOSITS).			

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)

Remarks

BH completed at 27.45 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 27.45m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:32

Percussive Borehole Log

BH102

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.62**	**23-02-15**	**3 of 3**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274663.0**	**189491.1**	**02-03-15**	**1:50**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	PROGRESS Date Time	PROGRESS Casing Water	STRATA Description	Legend	Depth, Level (thickness)	Install/ Backfill
20.00-20.45	D30	20.00	SPTs	N=20				Soft to firm grey and grey-brown slightly organic slightly sandy (fine) SILT with extremely closely spaced thin (<10m) horizons green-grey silty fine sand. Extensively disturbed by drilling. (TIDAL FLAT DEPOSITS). *(continued)* 20.00 - 23.40 Dominant constituent grading to sandy SILT/silty SAND below 20.00m depth, medium dense in-situ, becoming dense towards base of layer.		(4.30)	
21.40-21.60	B31										
21.50-21.95	D32	21.50	SPTs	N=28							
										22.80 *-12.18*	
22.90-23.20	B33							Dense green-grey, green-brown and dark grey very silty sandy GRAVEL with lowcobble content. Gravel and cobbles are mainly subrounded and tabular sandstone. (MARINE BEACH DEPOSITS)			
23.00-23.45	D34	23.00	SPTs	N=48						(1.90)	
						26/02/2015 17:00	**24.00**				
						27/02/2015 08:00	**24.00** *6.30*				
										24.70 *-14.08*	
24.90-25.30	B35							Very dense green grey and green-brown silty very sandy GRAVEL with low cobble content. Sand is fine to coarse, gravel and cobbles are subrounded to subangular frequently flat to tabular sandstone and occasional limestone, quartz and quartz conglomerate. (MARINE BEACH DEPOSITS).			
25.00-25.45	B36	25.00	SPTc	N=45/255						(2.75)	
26.40-26.50	B37					27/02/2015 17:00	**26.50**				
26.40-26.85	B38	26.50	SPTc	N=50		02/03/2015 08:00	**26.50** *6.40*				
27.00-27.45	B39										
		27.00	SPTc	N=49/170							
						02/03/2015 10:30	**27.00**	**End of Exploratory Hole**		**27.45** *-16.83*	

DRILLING TECHNIQUE From	To	Technique	CHISELLING Hard Strata From	To	Time	WATER OBSERVATIONS Date/Time	Strike At	Rise To	Casing	Sealed	HOLE/CASING DIAMETER Hole Dia.	Depth	Casing Dia.	Depth	WATER ADDED From	To	Volume (ltr)

Remarks
BH completed at 27.45 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 27.45m

HCL House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:32

Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.34**	**17-02-15**	**1 of 4**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274714.3**	**189596.2**	**25-02-15**	**1:50**

SAMPLES Depth	Type/ No.	TESTS Depth	Type/ No.	Results	Water Strikes	PROGRESS Date Time	Casing / Water	STRATA Description	Legend	Depth, Level (thickness)	Install/ Backfill
0.00-1.00	B4							Grass over TOPSOIL comprising moist brown slightly organic slightly sandy CLAY/SILT with occasional thin roots.		0.20 *9.14*	
0.20	ES1							MADE GROUND: Medium dense dark grey and green grey silty gravelly SAND with medium cobble content. Gravel and cobbles are irregular concrete, crushed/whole brick and subangular sandstone.		(0.70)	
0.50	ES2									0.90 *8.44*	
1.00	ES3							Medium dense pale brown/yellow-brown locally slightly silty fine/medium SAND. (BLOWN SAND)		(1.10)	
1.00-1.45	D5	1.00	SPTs	N=10	dry						
1.45-2.00	B6										
2.00-2.45	D7					17/02/2015	**2.00** *dry*			2.00 *7.34*	
		2.00	SPTs	N=6	dry	18/02/2015 08:00		Medium dense pale brown fine/medium SAND with occasional grey to dark grey silt lenses and irregular thick laminae up to 10mm thick. (BLOWN SAND)		(1.90)	
2.45-2.75	D8	2.45	SPTs	N=15*	dry						
2.75-3.00	B9										
3.00-3.45	D10	3.00	SPTs	N=18	dry						
3.45-4.00	B11										
4.00-4.45	D12									3.90 *5.44*	
		4.00	SPTs	N=13	dry			Medium dense brown and orange-brown silty fine to medium SAND thickly interlaminated with pale brown to yellow-brown fine to coarse sand. (BLOWN SAND)			
4.45-5.00	B13										
5.00-5.45	D14				1			3.90 - 6.60 Slightly silty to silty fine to medium sand is frequently weakly cemented in horizons up to 6.60m			
		5.00	SPTs	N=15	4,2					(2.70)	
5.00-5.50	B15										
5.50-6.50	B16										
6.50-6.95	D17									6.60 *2.74*	
		6.50	SPTs	N=23	5.2			Medium dense green grey-brown and pale brown fine to medium SAND with occasional fine/medium gravel size shell fragments and very closely spaced impersistent lenses up to 10mm thick of soft blue-grey organic silty clay. (TIDAL FLAT DEPOSITS)			
6.95-8.00	B18										
8.00-8.45	D19										
		8.00	SPTs	N=21	5.4						
8.00-8.50	B20										
8.50-9.50	B21					18/02/2015 17:00	**8.70** *5.40*			(5.00)	
						19/02/2015 08:00	**8.70** *5.20*				
9.50-9.95	D22										
		9.50	SPTs	N=17	5.3						
9.50-10.00	B23										
10.00-11.00	B24										

DRILLING TECHNIQUE From	To	Technique	CHISELLING Hard Strata From	To	Time	WATER OBSERVATIONS Date/Time	Strike At	Rise To	Casing	Sealed	HOLE/CASING DIAMETER Hole Dia.	Depth	Casing Dia.	Depth	WATER ADDED From	To	Volume (ltr)
0.00	1.20	Inspection Pit	23.00	23.40	1:00	18/02/2015 09:00	5.00	4.20	5.00	n/s	200	12.70	200	12.70			
1.20	30.40	Cable Percussion	24.70	25.00	1:00						150	30.00	150	29.80			
			29.40	29.80	1:00												

Remarks

BH completed at 30.40 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 30.40m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:34

Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.34**	**17-02-15**	**2 of 4**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274714.3**	**189596.2**	**25-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	**Casing** *Water*	Description	Legend	**Depth**, *Level* (thickness)	
11.00-11.45	D25	11.00	SPTs	N=18	5.2			Medium dense green grey-brown and pale brown fine to medium SAND with occasional fine/medium gravel size shell fragments and very closely spaced impersistent lenses up to 10mm thick of soft blue-grey organic silty clay. (TIDAL FLAT DEPOSITS) *(continued)*			
11.00-11.50	B26										
11.60-12.50	B27									**11.60** *-2.26*	
12.50-12.95	D28	12.50	SPTs	N=23	5.3			Thickly interlaminated medium dense green-grey and pale brown mottled very silty fine to medium SAND with occasional fine/medium gravel sized shell fragments AND soft to firm green grey organic slightly sandy clayey SILT with extremely closely spaced fine sand partings and with rare dark brown-black peaty inclusions (up to medium gravel size). (TIDAL FLAT DEPOSITS)		(2.40)	
						19/02/2015 17:00	**13.00** *5.40*				
						20/02/2015 08:00	**13.00** *4.50*				
13.80-14.10	B29										
14.00-14.45	D30	14.00	SPTs	N=13	NR					**14.00** *-4.66*	
								Soft to firm green-grey and green-brown slightly organic sandy (fine) SILT with extremely closely spaced silty fine sand lenses/partings up to 10mm thick. (TIDAL FLAT DEPOSITS) Below 18.40 m becoming thickly interlaminated very silty SAND and sandy SILT in approximately equal proportions.			
15.40-15.60	B31										
15.50-15.95	D32	15.50	SPTs	N=8	NR						
16.90-17.20	B33										
17.00-17.45	D34	17.00	SPTs	N=16	NR					(6.40)	
18.40-18.60	B35										
18.50-18.95	UT36			14blows							
19.90-20.20	B37										

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)

Remarks

BH completed at 30.40 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 30.40m

HCL House, St Mellons Business Park, St Mellons, Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:35

Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.34**	**17-02-15**	**3 of 4**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274714.3**	**189596.2**	**25-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Date / Time	Casing / Water	Description	Legend	Depth, *Level* (thickness)	
20.00-20.45	D38	20.00	SPTs	N=37	4.0	20/02/2015 17:00	**20.00**				
20.45-21.50	B39					23/02/2015 10:00	**20.00** *3.80*			**20.40** *-11.06*	
								Medium dense grey and green-grey clayey silty sandy GRAVEL with medium cobble content. Gravel and cobbles are mainly subrounded locally flat/tabular sandstone, up to 0.10m in size. (MARINE BEACH DEPOSITS)		(1.10)	
21.50-22.00	B41	21.50	SPTc	N=50/200	7.4					**21.50** *-12.16*	
								Very dense grey and grey-brown silty sandy GRAVEL with high cobble content. Sand is fine to coarse. Gravel and cobbles are subrounded to subangular frequent tabular/elongate sandstone and occasional quartz conglomerate. (MARINE BEACH DEPOSITS)		(3.00)	
23.00-23.50	B43	23.00	SPTc	N=50/190	7.2						
24.50-25.00	B45	24.50	SPTc	N=50/200	6.8	23/02/2015 17:00	**24.50** *7.20*			**24.50** *-15.16*	
						24/02/2015 08:00	**24.50** *6.80*	Very dense grey brown silty very sandy GRAVEL with medium cobbles. Sand is fine to coarse, gravel and cobbles are subrounded to subangular frequently tabular/elongate sandstone and occasional quartz-conglomerate. (MARINE BEACH DEPOSITS)		(4.20)	
25.70-26.00	B46	26.00	SPTc	N=50/145	7.3						
27.50-28.00	B50	27.50	SPTc	N=50/210	7.7						
28.70-29.00	B51									**28.70** *-19.36*	
29.00-29.40	D52	29.00	SPTc	N=50/255	8.1			Very stiff/hard darky grey-grey brown slightly sandy gravelly CLAY with variable cobble content. Coarse fragments are subrounded to subangular sandstone. (GLACIAL TILL).		(1.70)	
						24/02/2015 17:00	**29.80** *8.10*				
30.00-30.40	D53					25/02/2015 08:00	**29.80** *7.20*				

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)

Remarks

BH completed at 30.40 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 30.40m

HCL House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:35

Percussive Borehole Log

BH103

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.34**	**17-02-15**	**4 of 4**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274714.3**	**189596.2**	**25-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	PROGRESS		STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Date Time	**Casing** *Water*	Description	Legend	**Depth**, *Level* (thickness)	
		30.00	SPTc	N=50/200	7.2						
						25/02/2015	**29.80** *7.20*	**End of Exploratory Hole**		**30.40** *-21.06*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)

Remarks

BH completed at 30.40 m; dual installation as detailed.
*Double driven SPT: N value for 2nd drive.

Termination Depth: 30.40m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dando 2000**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS PERCUSSIVE BOREHOLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 30/06/2015 14:24:35

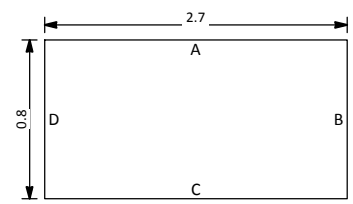
Trial Pit Log

TP121

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.80**	**16-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274840.9**	**189325.5**	**16-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	Install/ Backfill
						BLACK BITUMINOUS PAVING		*10.74*	
0.20	ES1					MADE GROUND: Dark grey-brown locally silty, very sandy GRAVEL. Silt and sand are predominantly slag, gravel is fine to coarse subangular aerated slag and occasional brick and sandstone.		**0.06** (0.20) **0.26** *10.54*	
0.35	B2					MADE GROUND: Pale grey brown sandy GRAVEL with medium cobble content. Gravel and cobbles are irregular aerated slag and consist of fine to medium gravel size fragments.		**0.40** *10.40*	
0.50	ES3					MADE GROUND: Brown and occasionally grey-brown locally slightly silty gravelly fine/medium SAND with low-medium cobble content. Gravel and cobbles are subangular aerated irregular slag and are brick and sandstone.		(0.40) **0.80** *10.00*	
0.60	B4								
						Pale yellow-brown fine to medium SAND with closely spaced impersistant lenses grey-brown silty sand. Occasional fine to medium gravel size slag fragments pushed into upper surface. (BLOWN SAND)		(0.80) **1.60** *9.20*	
1.20	ES5								
1.40	B6								
						Pale brown and pale grey-brown locally slightly silty fine to medium SAND. (BLOWN SAND)		(1.00)	
2.00	B7								
						End of Exploratory Hole		**2.60** *8.20*	

PLAN DETAILS



Long Axis Orientation:

135 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.6m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 2.60m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:18

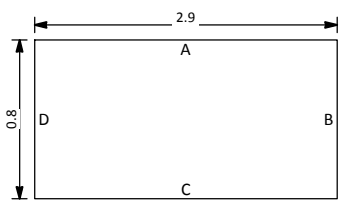
Trial Pit Log

TP122

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.83**	**16-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274798.4**	**189350.3**	**16-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
						MADE GROUND: Slightly moist dark grey-brown silty very sandy GRAVEL with low cobble content. Silt and sand are predominantly slag, gravel and cobbles are angular to subangular to aerated slag, some projecting from ground surface.		**0.11** *10.72*	
0.20	ES1							(0.21)	
0.30	B2					MADE GROUND: Dark grey-brown and occasionally purple-grey very sandy GRAVEL with medium cobble and medium boulder content. Sand is slag, coarse fragments are angular to subangular locally aerated slag up to 0.30 m in size.		**0.32** *10.51*	
0.50	ES3					Pale brown to yellow-brown and locally pale grey-brown mottled fine to medium SAND with rare dark grey-brown thin silt laminae to 0.55 m depth. (BLOWN SAND)			
0.70	B4							(1.08)	
1.00	ES5								
1.30	B6							**1.40** *9.43*	
						Pale brown locally slightly silty fine to /medium SAND. (BLOWN SAND)			
2.00	B7							(1.30)	
						End of Exploratory Hole		**2.70** *8.13*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapase with repeated excavation below 1.4m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 2.70m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:19

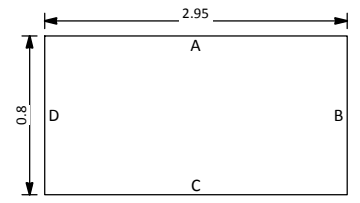
Trial Pit Log

TP123

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.85**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274763.1**	**189367.2**	**17-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.00-0.10	B1					MADE GROUND: Dark grey-brown slightly silty gravelly SAND with low cobble and boulder content. Cobbles and boulders are present at surface and locally protrude 15 mm to 25 mm. Sand is predominantly slag-based, gravel is fine to coarse angular to irregular slag and occasional brick. Cobbles and boulders are angular irregular slag up to 0.35m in size and occasional brick fragments. Occasional thin roots and organic sandy silt content at top of layer.		**0.12** *10.73*	
0.10	ES2								
0.30	B3					Pale yellow-brown fine to medium SAND with occassional dark grey-brown thin silt laminae in upper part (to 0.30m depth). (BLOWN SAND)		(0.63)	
0.50	ES4							**0.75** *10.10*	
1.00	B5					Pale brown fine to medium SAND with closely spaced impersistent weakly cemented very thinly bedded slightly silty sand. (BLOWN SAND)		(1.95)	
1.00	ES6								
1.80	B7								
2.70	B8					**End of Exploratory Hole**		**2.70** *8.15*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapase with repeated excavation below 1.2m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 2.70m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:19

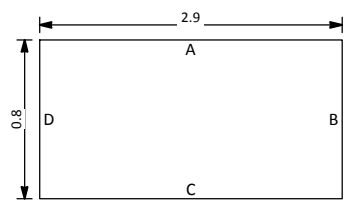
Trial Pit Log

TP124

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**11.10**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274789.4**	**189393.2**	**17-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.10-0.40	B1					MADE GROUND: Dark grey-brown silty gravelly SAND with frequent thin roots. Silt and sand are slag and organic material. Gravel is fine to medium, angular to subangular slag.		*11.06* **0.04**	
0.20	ES2					MADE GROUND: Dark grey-brown slightly silty SAND AND GRAVEL with low cobble and low small boulder content. Silt and sand are slag. Gravel, cobble and boulders are angular to subangular to irregular slag (often aerated) up to 0.25 m in size.		(0.44)	
0.50	ES3							**0.48** *10.62*	
0.70	ES4					MADE GROUND: Pale yellow-brown and pale grey-brown mottled slightly gravelly fine to medium SAND with occasional laminae of dark grey silty sand. Gravel is coarse slag fragments mainly present at surface. Slag fragments and dark veining absent below 0.55 m depth.			
1.00	ES5					0.85 - 1.05 m zone of frequent grey-brown silty sand inclusions and impersistent lenses of stiff dark green-grey slightly gravelly clay and dark grey-black organic clay and silt.		(0.87)	
								1.35 *9.75*	
1.50	B6					MADE GROUND: Soft to firm dark grey-black slightly organic CLAY, thinly interbedded with loose yellow brown fine to medium SAND.		(0.20)	
								1.55 *9.55*	
2.60	B7					Pale brown fine to medium SAND with closely spaced impersistent weakly cemented lenses up to 20mm thick. (BLOWN SAND).		(1.20)	
								2.75 *8.35*	
3.20	B8					Pale brown and yellow-brown slightly silty fine to medium SAND with closely spaced thin fine-coarse bedding. (BLOWN SAND).		(0.45)	
						End of Exploratory Hole		**3.20** *7.90*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.6m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.20m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:20

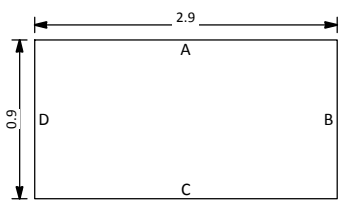
Trial Pit Log

TP125

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.98**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274767.5**	**189414.7**	**17-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
0.10-0.19	ES1					MADE GROUND: Dark grey-brown silty gravelly SAND with frequent thin roots. Sand composed of slag and organic material, gravel is fine to medium angular to subangular irregularly formed slag.		(0.19)	
0.20	ES2							**0.19** *10.79*	
0.20	B3					MADE GROUND: Dark grey-brown slightly silty very sandy GRAVEL with low cobble and small boulder content. Sand comprises slag. Gravel, cobble and boulder are subrounded to subangular irregularly formed slag (often aerated).		**0.32** *10.66*	
0.35	B4					MADE GROUND: Pale grey and grey-brown slightly silty slightly sandy GRAVEL with low cobble and small boulder content. Sand is slag-based. Gravel and cobbles are irregularly formed aerated low-density slag. Locally with flat and irregular boulder size slag fragements up to 0.40 m in size.		**0.46** *10.52*	
0.50	ES5								
0.60	B6					MADE GROUND: Slightly damp pale brown and grey-brown mottled locally slightly silty slightly gravelly fine to medium SAND. Occasional fine to coarse irregular gravel size slag fragments present at surface. Slag fragments absent below 0.60m depth. Grey-brown mottling increasing below 0.85m depth, often composed of silty and weakly cemented fine to medium sand.		(0.49)	
1.00	ES7							**0.95** *10.03*	
						MADE GROUND: Slightly damp pale brown slightly silty to silty fine to medium SAND with occasional pale grey-brown mottling and impersistent weakly cemented horizons up to 20 mm thick.		(0.50)	
1.50	B8							**1.45** *9.53*	
						MADE GROUND: Firm grey green-grey slightly gravelly CLAY. Gravel is fine to medium and locally coarse angular flat to elongate mudstone.		*9.46* **1.52**	
						Dry pale brown and yellow-brown locally slightly silty fine to medium SAND with closely spaced weakly cemented bedding. Rare gravel of fine to medium subrounded and angular sandstone and angular flat mudstone, surrounded by grey-brown discolouration. (BLOWN SAND).		(1.88)	
2.20	B9								
						End of Exploratory Hole		**3.40** *7.58*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.6m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.40m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:21

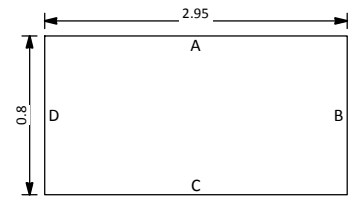
Trial Pit Log

TP126

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.82**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274742.6**	**189450.7**	**17-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, Level (thickness)	Install/ Backfill
0.05	B1					MADE GROUND: Medium dense grey-brown and purple-brown slightly silty sandy GRAVEL. Silt and sand are composed of ash, slag and partially organic soil. Gravel is fine to coarse subangular irregular slag and occasional brick of concrete. Low cobble content of brick fragments and aerated slag fragments.		**0.16** *10.66*	
0.15	ES2					MADE GROUND: Medium dense pale brown and occasionally grey-brown mottled slightly silty fine to medium SAND with occasional irregular gravel size slag fragments present at surface. Rare fine subangular flat mudstone gravel.		(0.40)	
0.50	ES3								
0.50	B4							**0.56** *10.26*	
						MADE GROUND: Loose to medium dense pale brown and yellow-brown locally slightly silty fine to medium SAND. Rare fine subangular flat mudstone gravel .		(0.34)	
0.80	B5								
0.90	ES6							**0.90** *9.92*	
1.00	ES7								
1.00	B8					MADE GROUND: Firm dark-grey silty slightly gravelly CLAY. Gravel is fine/medium angular flat/elongate mudstone (reworked Glacial Till).		**1.05** *9.77*	
						Pale yellow-brown slightly silty fine to medium SAND with closely spaced impersistent pale grey-brown silty sand inclusions up to 50 mm thick. Rare fine angular mudstone gravel. (BLOWN SAND)			
1.60	B9							(2.15)	
2.50	B10								
						End of Exploratory Hole		**3.20** *7.62*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.20m

HCL House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:21

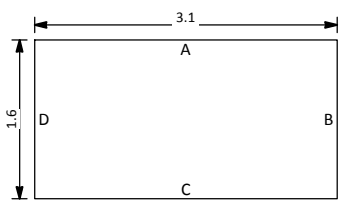
Trial Pit Log

TP127

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.66**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274711.5**	**189570.2**	**18-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
						TOPSOIL: brown slightly organic slightly sandy SILT with frequent thin roots and occasional plastic debris.		**0.11** *9.55*	
0.20	ES1					MADE GROUND: Soft to firm pale-mid brown sandy locally slightly gravelly SILT with occasional thin roots. Sand is fine to medium. Gravel is fine to medium subangular elongate limestone and sandstone.		(0.34)	
0.30	B2							**0.45** *9.21*	
0.50	ES3					MADE GROUND: Firm orange-brown and locally mottled brown to grey-brown silty slightly sandy slightly gravelly CLAY with rare thin roots. Gravel is fine to medium subangular sandstone. Below 0.6 m with low cobble and boulder content of bitumen, concrete and whole bricks up to 0.25 m in size. Section of waste 60 mm dia of plastic yellow pipe embedded in boulder material aligned S-N through pit at 0.65m depth.		(0.40)	
0.50	B4							**0.85** *8.81*	
0.75	ES5					Pale yellow-brown slightly silty fine to medium SAND with occasional lenses of coarse sand and firm brown slightly sandy clay. (BLOWN SAND)		(0.55)	
0.90	B6					0.95 - 1.00 Clay lenses absent below 0.95m.		**1.40** *8.26*	
1.00	ES7					Pale brown locally slightly silty fine to medium SAND. Rare fine subangular flat to elongate mudstone gravel. (BLOWN SAND).		(1.60)	
2.00	B8								
2.80	B9					**End of Exploratory Hole**		**3.00** *6.66*	

PLAN DETAILS



Long Axis Orientation:

135 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.00m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:22

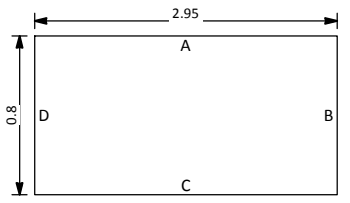
Trial Pit Log

TP128

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.41**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274691.8**	**189619.1**	**18-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
						Strong grey CONCRETE floor slab. 6mm diameter plain reinforcing spanning 2 directions (NW-SE and NE-SW) at 0.30 c/c at 0.16m depth. Polythene damp proof membrane at base.		(0.20) **0.20** *9.21*	
0.25	ES1					MADE GROUND: Brown locally mottled yellow brown slightly silty slightly gravelly fine to medium SAND with low cobble content. Gravel is fine-coarse crushed brick fragments , irregular aerated slag and sandstone. Cobbles are brick fragments.		(0.23) **0.43** *8.98*	
0.50	ES2					Pale brown and yellow-brown locally slightly silty fine to medium SAND with very closely spaced impersistent lenses of brown silty sand and pale brown silty clay up to 20mm thick (BLOWN SAND)		(0.52) **0.95** *8.46*	
0.60	B3								
1.00	B4					Firm brown and orange-brown mottled slightly sandy slightly gravelly CLAY. Gravel is fine to medium subangular mudstone. (BLOWN SAND)		**1.05** *8.36*	
1.00	ES5					Pale brown and locally yellow-brown occasionally fine to medium SAND. Rare fine to coarse subangular sandstone and brown clay lenses (BLOWN SAND).		(2.55)	
2.00	B6								
3.00	B7					**End of Exploratory Hole**		**3.60** *5.81*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.05m

Groundwater (description): Not Encountered

Remarks

Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth: 3.60m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:22

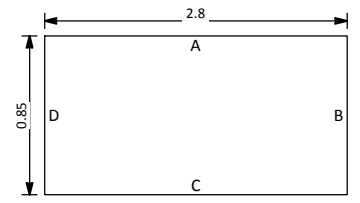
Trial Pit Log

TP129

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.36**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274661.6**	**189642.8**	**18-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	Install/ Backfill
						Strong grey CONCRETE floor slab. 6mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.15m centres at 0.08m depth. Polythene damp proof membrane at base.		**0.13** *9.23*	
0.20	ES1					MADE GROUND: Pale brown and yellow-brown locally slightly silty fine to medium SAND with occasional dark grey irregular laminae. Occasional inclusions upto 63 mm of firm orange-brown slightly gravelly clay. Rare subangular elongated mudstone gravel. Clay inclusions absent below 0.42 m depth.		(0.49)	
0.40	B2								
0.50	ES3							**0.62** *8.74*	
0.75	ES4					Firm orange-brown and brown clayey slightly gravelly SILT with brown grey-brown sandy partings. Gravel is fine subangular limestone (possible former Topsoil).		(0.23)	
0.75	B5							**0.85** *8.51*	
0.90	B6					Pale brown yellow-brown locally slightly silty fine to medium SAND. Rare fine subangular flat mudstone gravel, surrounded by grey-brown discolouration. (BLOWN SAND)		(0.35)	
1.00	ES7							**1.20** *8.16*	
						Pale brown slightly silty fine to medium SAND with closely spaced weakly cemented lenses and horizons and rare brown silty clay lenses. (BLOWN SAND)			
1.80	B8								
2.50	B9							(2.40)	
3.50	B10								
						End of Exploratory Hole		**3.60** *5.76*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.2m

Groundwater (description): Not Encountered

Remarks

Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth: 3.60m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:23

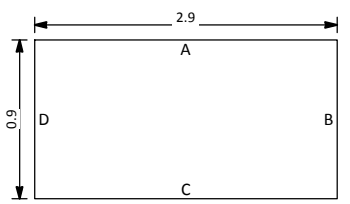
Trial Pit Log

TP130

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**9.43**	**19-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274645.1**	**189623.0**	**19-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	Install/ Backfill
						Strong grey CONCRETE floor slab. 6 mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.15 m centres at 0.08 m depth. Polythene damp proof membrane at base.		**0.17** *9.26*	
0.20	ES1					MADE GROUND: Pale brown yellow-brown slightly silty fine to medium SAND. Rare occasional fine to medium gravel of irregularly formed aerated slag.		(0.38)	
0.40	B2								
0.50	ES3							**0.55** *8.88*	
						Pale brown locally slightly silty fine to medium SAND. Rare fine to medium subangular elongate mudstone (BLOWN SAND).		(2.05)	
0.90	B4								
1.00	ES5								
2.00	B6								
2.50	B7								
						End of Exploratory Hole		**2.60** *6.83*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 0.8m

Groundwater (description): Not Encountered

Remarks

Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth: 2.60m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: JCB 3CX

Contractor: Hyder Consulting (UK) Ltd

Logged By: MWms

Checked By: GRW

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:24

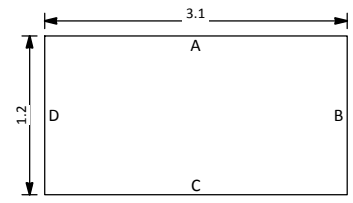
Trial Pit Log

TP131

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.70**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274654.6**	**189594.4**	**18-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	Install/ Backfill
						Dense bituminous surface dressing.		*10.62*	
0.20	ES1					MADE GROUND: Red purple-brown very sandy GRAVEL. Sand comprises ash and slag. Gravel is fine to medium irregular aerated low density slag and occasional brick fragments		**0.08** *10.56*	
0.30	B2					MADE GROUND: Dark grey to black slightly silty very sandy GRAVEL with low cobble content. Silt and sand comprise ash and slag. Gravel and cobbles are irregular aerated low density slag and clinker, often oxidised and occasional fragments of foundry brick.		**0.14** (0.26) **0.40** *10.30*	
0.50	B3					MADE GROUND: Pale brown and grey-brown mottled slightly silty fine to medium SAND with occasional irregular dark grey veining. Rare fine to medium subangular flat to elongate mudstone gravel.		**0.52** *10.18*	
0.50	ES4					Pale yellow-brown and occasionally pale grey-brown mottled locally slightly silty fine to medium SAND. Rare fine subangular elongate mudstone gravel. (BLOWN SAND)			
1.00	ES5								
1.00	B6							(2.18)	
2.20	B7								
						End of Exploratory Hole		**2.70** *8.00*	

PLAN DETAILS



Long Axis Orientation:

135 degrees

Shoring / Support: None

Stability: Severe collapase with repeated excavation below 0.6m

Groundwater (description): Not Encountered

Remarks

Bituminous surface broken out using hydraulic hammer on 16/02/2015

Termination Depth: 2.70m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:24

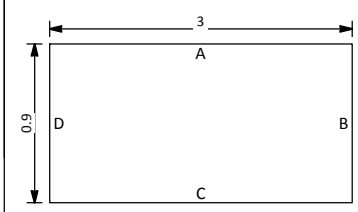
Trial Pit Log

TP132

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.62**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274675.0**	**189570.9**	**18-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
0.10	ES1					MADE GROUND: Grey-brown slightly silty sandy GRAVEL with low cobble content. Gravel and cobbles comprise fragments of irregular crushed concrete, occasional brick, ceramic tile and bituminous bound material. Occasional steel reinforcement.		**0.17** *10.45*	
0.20	B2							*10.39*	
0.20	ES3					MADE GROUND: Red purple-brown very sandy GRAVEL. Sand comprises ash and slag. Gravel is fine to medium irregularly formed aerated low density slag and occasional fine brick fragments.		**0.23**	
0.30	B4							(0.20)	
0.40	ES5					MADE GROUND: Dark grey to black slightly silty very sandy GRAVEL with low cobble content. Sand is ash and slag derived. Gravel and cobbles are irregularly formed aerated low-density slag/clinker, often oxidised. Becoming silty towards base.		**0.43** *10.19*	
0.60	ES6							(0.19)	
						Pale brown and grey-brown mottled slightly silty fine to medium SAND. Occasional fine to medium subangular flat-elongate sandstone and mudstone gravel. (BLOWN SAND).		**0.62** *10.00*	
						Pale brown yellow-brown locally slightly silty fine to medium SAND. (BLOWN SAND)			
1.00	ES7							(0.78)	
1.00	B8								
								1.40 *9.22*	
						Pale brown locally slightly silty fine to medium SAND with closely spaced horizons up to 20 mm thick of grey-brown silty sand and yellow-brown fine to coarse sand. (BLOWN SAND)			
2.00	B9							(2.00)	
						End of Exploratory Hole		**3.40** *7.22*	

PLAN DETAILS



Long Axis Orientation:

135 degrees

Shoring / Support: None

Stability: Severe collapase with repeated excavation below 1.4m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.40m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:25

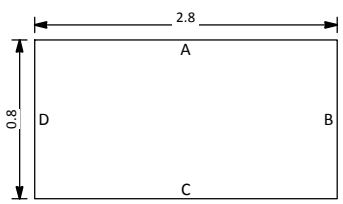
Trial Pit Log

TP133

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.68**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274679.4**	**189533.6**	**18-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	Install/ Backfill
						BITUMINOUS wearing course.		*10.64*	
						BITUMINOUS base course, partially decomposed.		**0.04** *10.53*	
0.20	ES1					MADE GROUND: Red-brown slightly silty SAND AND GRAVEL. Silt and sand comprise ash. Gravel is fine to medium irregularly formed aerated slag, clinker and occasional foundry brick fragments.		**0.15** *10.41*	
0.25	B2							**0.27**	
0.40	ES3					MADE GROUND: Dark grey-black slightly silty sandy GRAVEL with low cobble content. Sand comprises slag. Gravel and cobbles are iregularly formed aerated and often oxidised low-density slag and whole or broken foundry brick fragments. Large flat concrete fragment encountered 0.47 m to 0.55 m in northern corner of pit at least 0.50 m visible length.		(0.28)	
0.50	B4							**0.55** *10.13*	
0.70	ES5					MADE GROUND: Pale brown and grey-brown mottled locally slightly silty slightly gravelly fine to medium SAND. Gravel is fine to medium subrounded irregular aerated slag.		(0.40)	
0.80	B6							**0.95** *9.73*	
1.00	ES7					Pale brown and yellow-brown locally slightly silty fine to medium SAND, locally with very closely spaced grey-brown silty sand laminae up to 10 mm thick. Rare fine subangular flat mudstone gravel. (BLOWN SAND)		(0.65)	
1.20	B8							**1.60** *9.08*	
2.20	B9					Pale brown locally slightly silty fine to medium SAND with very closely spaced impersistent grey-brown silty sand laminae upto 10 mm thick. (BLOWN SAND)		(1.20)	
						End of Exploratory Hole		**2.80** *7.88*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 2.80m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:26

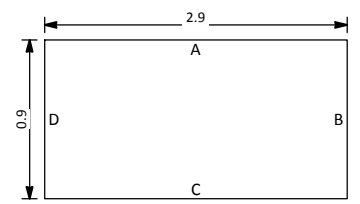
Trial Pit Log

TP134

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.26**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274649.8**	**189558.0**	**17-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
0.20	ES1					MADE GROUND: Grey slightly silty sandy GRAVEL with low cobble and boulder content. Gravel, cobbles and boulders comprises angular rubble of irregular concrete, brick and cemented brick panels up to 0.25 m in size. Occasional glass, ceramic tile, electrical wire, plastic sheet, timber and rockwool fragments.		(0.28)	
0.30	ES2							**0.28** *9.98*	
0.40	B3					MADE GROUND: Brown and locally yellow-brown mottled slightly silty slightly gravelly fine to medium SAND with occasional lenses of stiff dark grey gravelly clay. Gravel is fine angular mudstone and occasional brick fragments. Sand is locally weakly cemented.		**0.38** *9.88*	
0.50	ES4					MADE GROUND: Pale yellow-brown locally slightly silty slightly gravelly fine to medium SAND with occasional grey-brown mottling including thin (<10 mm thick) grey sandy silt lenses. Low cobble content. Gravel and cobbles are subangular irregularly formed aerated slag Tangled steel reinforcements in NW face at 0.55m. Corroded steel mesh reinforcement in SE face at 1.05m depth.			
0.90	B5								
1.00	ES6					Face of concrete strip foundation uncovered along part of NW face between 1.10m and 1.40m, bearing on silty sand at 2.05m.		(1.22)	
1.50	B7							**1.60** *8.66*	
						MADE GROUND: Firm to stiff dark grey slightly gravelly CLAY. Gravel is fine to medium angular flat to elongate mudstone. Occasional timber lengths at top of layer. (Former Topsoil layer?)		(0.45)	
								2.05 *8.21*	
2.50	B8					Pale brown and yellow-brown locally slightly silty fine to medium SAND. Rare fine to medium subrounded to subangular flat sandstone and mudstone gravel. (BLOWN SAND).		(1.05)	
						End of Exploratory Hole		**3.10** *7.16*	

PLAN DETAILS



Long Axis Orientation:

135 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 0.95m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.10m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:26

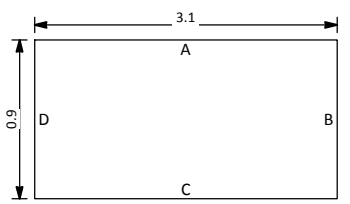
Trial Pit Log

TP135

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.28**	**19-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274628.9**	**189579.1**	**19-02-15**	**1:25**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
						Strong grey CONCRETE floor slab with 6mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.20m centres at 0.04m depth. No underlying damp proof membrane.		**0.11** *10.17*	
0.20	ES1					MADE GROUND: Grey-brown slightly silty fine to medium SAND with rare fine to medium subangular sandstone, mudstone and slag gravel with impersistent dark grey slightly organic horizons below 0.29 m, containing coarse sand-fine gravel size mudstone fragments.		(0.34)	
0.30	B2							**0.45** *9.83*	
0.50	ES3					MADE GROUND: Pale brown locally slightly silty fine to medium SAND with occasional grey-brown mottling. Laterally impersistant horizons up to 50 mm thick of dark grey slightly gravelly clay in SE face of pit at 0.8 - 0.95 m depth. Concrete foundation exposed in NW face of pit at 0.90-1.35m depth.		(0.50)	
0.50	B4							**0.95** *9.33*	
1.00	ES5					Pale brown locally slightly silty fine to medium SAND. (BLOWN SAND)		(1.85)	
1.00	B6								
2.00	B7								
						End of Exploratory Hole		**2.80** *7.48*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.35m

Groundwater (description): Not Encountered

Remarks

Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth: 2.80m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:27

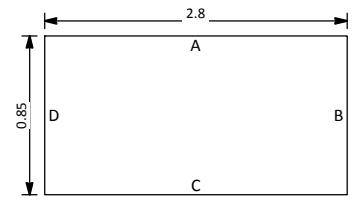
Trial Pit Log

TP136

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.64**	**19-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274595.0**	**189582.1**	**19-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
						Ceramic tiles over cement-grout.		**0.09** *10.55*	
0.25	ES1					Strong grey CONCRETE floor slab with 6 mm diameter plain reinforcement spanning 2 directions (NW-SE and NE-SW) at 0.15 m centres at 0.14 m depth.		**0.24** *10.40*	
						MADE GROUND: Grey cementitious sandy GRAVEL with rare cobbles. Gravel and cobbles are mainly weak concrete and mortar with occasional brick and clay tile fragments.		**0.37** *10.27*	
0.50	B2					MADE GROUND: Grey-brown slightly silty fine to medium SAND with occasional yellow-brown mottling. Rare fine subangular flat mudstone gravel.		(0.26)	
0.50	ES3							**0.63** *10.01*	
0.70	B4					MADE GROUND: Grey green-grey and locally brown mottled slightly silty slightly gravely fine to medium SAND. Gravel is fine to medium subrounded-subangular elongate sandstone and angular flat mudstone. Occasional dark-grey organic lenses.			
0.75	ES5					At 1.35 m in NW face - partially decomposed charred timber.		(0.72)	
								1.35 *9.29*	
1.40	ES6					Pale brown yellow-brown slightly silty fine to medium SAND with closely spaced green grey silty sand lenses/inclusions. (BLOWN SAND)			
1.50	B7					Green-grey inclusions absent below 1.60m depth.			
2.00	B8							(1.85)	
3.00	B9								
						End of Exploratory Hole		**3.20** *7.44*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 2m

Groundwater (description): Not Encountered

Remarks

Concrete surface broken out using hydraulic hammer on 16/02/2015

Termination Depth: 3.20m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:28

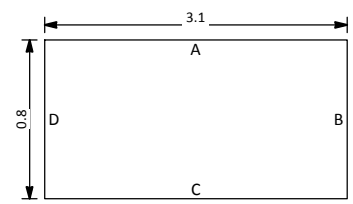
Trial Pit Log

TP137

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.49**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274619.2**	**189542.0**	**17-02-15**	**1:25**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
0.20	ES1					MADE GROUND: Grey and grey-brown slightly silty sandy GRAVEL with low cobble content. Gravel and cobbles comprise crushed concrete, whole and half bricks fragments and occaional mortar and ceramic tile fragments with occasional pale brown and dark grey-brown sandy slightly gravelly (fine) clay inclusions below 0.13m depth.		(0.29)	
								0.29 *10.20*	
0.35	ES2					MADE GROUND: Pale grey cementitous sandy GRAVEL with medium cobble content. Gravel and cobbles are irregular crushed concrete and limestone aggregate.		**0.45** *10.04*	
0.50	ES3								
0.50	B4					MADE GROUND: Stiff green-grey, green brown and orange-brown mottled silty slightly gravelly CLAY with occasional dark grey veining. Gravel is fine to medium subangular mudstone.		**0.53** *9.96*	
0.70	B5					MADE GROUND: Grey-brown, orange brown and dark grey mottled slightly silty gravelly fine to medium SAND. Sand comprises grey ash, gravel is crushed slag/clinker and occasional brick. Rare glass and ceramic tile fragments towards base of layer..		(0.30)	
								0.83 *9.66*	
0.90	B6					Pale brown yellow-brown occasionally slightly silty fine to medium SAND with closely spaced weakly cemented lenses up to 50mm thick. Rare fine to medium subangular elongate sandstone and mudstone gravel. (BLOWN SAND)			
1.00	ES7								
1.80	B8							(1.17)	
								2.00 *8.49*	
2.50	B9					Pale yellow-brown fine to medium SAND. (BLOWN SAND)		(1.40)	
						End of Exploratory Hole		**3.40** *7.09*	

PLAN DETAILS



Long Axis Orientation:

45 degrees

Shoring / Support: None

Stability: Severe collapse with repeated excavation below 1.6m

Groundwater (description): Not Encountered

Remarks

Termination Depth: 3.40m

HCL House St Mellons Business Park St Mellons Cardiff CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **JCB 3CX**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS TRIAL PIT LOG EXCL OF WALL SKETCH Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:47:28

Windowless Sample Log

WS141

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.80**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274820.4**	**189322.8**	**17-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.10-1.00	B1					Black BITUMINOUS paving.		*10.74*	
0.30-0.50	ES2					MADE GROUND: Grey slightly silty very sandy GRAVEL with low cobble content. Gravel and cobbles are irregular, aerated slag and occasional brick.		**0.06** *10.50*	
						MADE GROUND: Pale brown and grey brown mottled locally slightly silty fine to medium SAND with occasional fine to medium gravel size irregular slag fragments.		**0.30** (0.60)	
0.90-1.10	ES3							**0.90** *9.90*	
		1.00	SPTc	N=12	dry	MADE GROUND: Firm dark grey locally mottled black slightly gravelly CLAY. Gravel is fine to medium subangular elongate mudstone.		**1.10** *9.70*	
1.20-1.40	ES4					Medium dense pale brown locally slightly silty fine to medium SAND with very closely spaced irregular pale grey-brown veining and thin (<2mm) dark grey veins in upper part (to 1.40m depth). (BLOWN SAND)		(0.80)	
1.50-1.90	B5							**1.90** *8.90*	
		2.00	SPTc	N=12	dry	Medium dense, becoming loose pale brown locally slightly silty fine to medium SAND with very closely spaced pale yellow brown fine to coarse sand horizons. (BLOWN SAND)			
2.50-3.00	B6							(1.45)	
		3.00	SPTc	N=8	dry			**3.35** *7.45*	
3.50-4.00	B7					Loose pale brown locally mottled orange-brown slightly silty fine to medium SAND with closely spaced irregular pale grey brown veins. (BLOWN SAND)		(1.10)	
		4.00	SPTc	N=10	dry				
						End of Exploratory Hole		**4.45** *6.35*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00 1.10	1.10 4.45	Inspection Pit Dynamic Sampled									101 87 77 66	1.00 2.00 3.00 4.45	116	1.00			

Remarks

Unable to progress below 4.0 m due to caving/collapse of hole.
No installation backfilled with bentonite pellets on completion.

Termination Depth: 4.45m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:44:55

Windowless Sample Log

WS142

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.83**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274824.5**	**189348.0**	**17-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
						Black BITUMINOUS paving.		*10.78*	
0.20-0.30	ES1					MADE GROUND: Grey slightly silty very sandy GRAVEL of irregularly formed aerated slag and occasional brick.		**0.05** *10.62*	
0.50-0.60	ES2					MADE GROUND: Dark grey-brown very sandy GRAVEL with high cobble content. Gravel comprises subangular irregularly formed aerated slag and occasional brick. Cobbles comprise whole and half brick fragments and high density slag fragments below 0.70 m depth.		**0.21** (0.69)	
0.90-1.00	ES3							**0.90** *9.93*	
1.10-1.50	B4	1.00	SPTc	N=18	dry	Medium dense pale brown and pale grey-brown mottled locally slightly silty fine to medium SAND. Rare fine angular mudstone gravel and thin laminations (5 mm) dark grey clay and silt. (BLOWN SAND)			
		2.00	SPTc	N=12	dry			(2.35)	
2.50-3.00	B5								
		3.00	SPTc	N=11	dry			**3.25** *7.58*	
						Loose pale brown/grey-brown slightly silty fine to medium SAND. (BLOWN SAND)		(0.50)	
								3.75 *7.08*	
		4.00	SPTc	N=19	dry	Medium dense pale brown/yellow brown locally slightly silty fine to medium SAND. (BLOWN SAND)		(0.70)	
						End of Exploratory Hole		**4.45** *6.38*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00 1.10	1.10 4.45	Inspection Pit Dynamic Sampled									101 101 87 77	1.00 2.00 3.00 4.45	116	1.00			

Remarks

Unable to progress below 4.0 m due to caving/collapse of hole.
No installation backfilled with bentonite pellets on completion.

Termination Depth: 4.45m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:44:56

Windowless Sample Log

WS143

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**11.10**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274736.5**	**189400.9**	**17-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.20-0.30	ES1					MADE GROUND: Soft dark grey-brown slightly gravelly CLAY with frequent thin roots. Gravel comprises fine to coarse angular slag.		*11.04*	
								0.06	
0.40-0.75	B2					MADE GROUND: Pale mid-grey sandy GRAVEL with low cobble content. Cobbles of irregular aerated low density slag.		*10.78*	
								0.32	
0.40-0.50	ES3					MADE GROUND: Pale brown to greenish grey GRAVEL with mottled slightly dark grey organic veins. Gravel comprises fine to coarse angular slag and fine to medium sub angular sandstone.		(0.43)	
0.90-1.00	B4							**0.75** *10.35*	
1.10-1.20	ES5	1.00		N=37	dry	MADE GROUND: Dark grey-black clayey/silty slightly sandy GRAVEL of fine to medium angular flat to elongate carbonaceous mudstone and occasional coal.		**1.05** *10.05*	
1.40-2.00	B6					0.80-0.86 m - thin horizons of pale brown and dark grey-brown slightly silty fine to medium sand.			
						MADE GROUND: Dense pale brown locally slightly silty fine to medium SAND with occasional irregular pale grey brown and dark grey veins.		(1.29)	
		2.00		N=50/190	dry	Obstruction in SPT at 2.34 m			
						End of Exploratory Hole		**2.34** *8.76*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.10	Inspection Pit									101	1.00	116	1.00			
1.10	2.34	Dynamic Sampled									87	2.34					

Remarks

Unable to progress below 2.34 m due to obstruction. Relocated to WS143A.
No installation backfilled with bentonite pellets on completion.

Termination Depth: 2.34m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:44:57

Windowless Sample Log

WS143A

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**11.11**	**17-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274737.8**	**189400.8**	**17-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	Install/ Backfill
						MADE GROUND: Grass over soft moist dark grey-brown slightly gravelly CLAY with frequent thin roots. Some fine to coarse angular slag gravel at base of layer.		*11.05* **0.06** *10.79*	
						MADE GROUND: Dense pale mid-grey sandy gravel with rare cobbles of irregular aerated low density slag.		**0.32** (0.43)	
						MADE GROUND: Medium dense pale brown green-grey very dark grey mottled slightly organic veins. Rare fine to medium subangular sandstone GRAVEL.		**0.75** *10.36*	
						MADE GROUND: Dense dark grey-black clayey silty slightly sandy GRAVEL of fine to medium angular flat elongate carbonaceous mudstone and occasional coal. 0.80-0.86m - thin horizons of pale brown and dark grey-brown slightly silty fine to medium sand.		**1.05** *10.06*	
						MADE GROUND: Medium dense pale brown locally slightly silty fine to medium sand with occasional irregular pale grey brown and dark grey veins (REWORKED BLOWN SAND).		(0.95)	
						End of Exploratory Hole		**2.00** *9.11*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.20	Inspection Pit									101	1.00					
1.20	2.00	Dynamic Sampled									87	2.00					

Remarks

Unable to progress below 2.0 m due to obstruction.
Installation: Flush cover in concrete. 50 mm OD plain pipe GL to 1.0 m then slotted pipe to 2.0 m. Gravel filter material 1.0 m to 2.0 m

Termination Depth: 2.00m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:44:58

Windowless Sample Log

WS144

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.79**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274695.4**	**189436.3**	**18-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.10-0.20	ES1					Black BITUMINOUS paving.		*10.69*	
								0.10	
0.35-5.00	ES2					MADE GROUND: Dark grey-brown slightly silty very sandy GRAVEL. Gravel comprises fine to coarse crushed brick and irregular aerated slag.		*10.45*	
								0.34	
0.35-0.65	B3					MADE GROUND: Dense pale brown and locally grey-brown mottled slightly silty fine to medium SAND.		*10.14*	
								0.65	
0.65-0.85	ES4					MADE GROUND: Pale brown and grey-brown mottled slightly silty fine to medium SAND with frequent dark grey mottling and veining containing rare fine subangular flat mudstone gravel.		*9.94*	
								0.85	
0.95-1.00	ES5	1.00	SPTc	N=37	dry	Dense pale brown yellow-brown locally slightly silty fine to medium SAND with closely spaced irregular grey-brown veining and black organic speckling in upper part. (BLOWN SAND)			
1.00-1.50	B6							(0.75)	
								1.60	*9.19*
		2.00	SPTc	N=21	dry	Medium dense pale brown slightly silty fine to medium SAND with closely space yellow-brown fine-coarse sand lenses, and rare thin (<2mm) dark grey veining with closely spaced weakly cemented horizons up to 50 mm thick. (BLOWN SAND)			
						Below 2.50 m depth with occasional coarse sand-fine gravel size carbonaceous mudstone fragments.			
2.50-3.00	B7					Below 4.40 m depth, surrounded by grey brown discolouration			
		3.00	SPTc	N=29	dry			(3.05)	
3.50-4.00	B8								
		4.00	SPTc	N=22	dry				
								4.65	*6.14*
						Dense pale grey brown thinly laminated slightly silty fine to medium SAND with very closely spaced orange brown fine-coarse horizons.			
		5.00	SPTc	N=40	dry			(0.80)	
						End of Exploratory Hole		**5.45**	*5.34*

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.10	Inspection Pit									101	1.00	116	1.00			
1.10	5.45	Dynamic Sampled									87	2.00					
											87	3.00					
											77	4.00					
											77	5.45					

Remarks

Terminated at scheduled depth.
Installation: Flush cover set in concrete. 50 mm OD plain pipe GL to 1.0 m then slotted to 4.8 m. Gravel filter material 1.0 m to 4.8 m

Termination Depth: 5.45m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:44:59

Windowless Sample Log

WS145

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.65**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274668.6**	**189465.2**	**18-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.15-0.25	ES1					Black BITUMINOUS paving.		*10.59*	
								0.06 *10.49*	
0.40-0.50	ES2					MADE GROUND: Grey and pink-brown sandy GRAVEL of fine to coarse subangular sandstone and limestone.		*10.25*	
								0.16	
						MADE GROUND: Purple brown and dark grey sandy GRAVEL. Sand comprises ash and slag. Gravel is fine to coarse irregularly formed aerated low density slag/clinker.		*10.00*	
0.75-1.20	B3							**0.40**	
0.80-1.00	ES4					MADE GROUND: Greenish grey brown slightly silty slightly gravelly fine to medium SAND. Gravel is fine to medium subangular elongate sandstone and occasional brick and slag. Gravel is fine angular flat mudstone.		**0.65**	
		1.00	SPTc	N=16	dry	Medium dense pale brown/yellow-brown locally slightly silty fine to medium SAND with rare fine to coarse angular flat mudstone and coal gravel. Closely spaced irregular grey-brown veins in upper part (to 1.20 m depth). (BLOWN SAND)		(2.15)	
2.00-2.50	B5	2.00	SPTc	N=17	dry				
								2.80 *7.85*	
		3.00	SPTc	N=17	dry	Medium dense, locally becoming loose pale brown slightly silty fine to medium SAND with closely spaced thin pale yellow brown fine to coarse sand horizons. Rare fine subangular sandstone gravel. (BLOWN SAND)			
3.50-4.00	B6							(1.90)	
		4.00	SPTc	N=8	dry				
								4.70 *5.95*	
		5.00	SPTc	N=24	dry	Medium dense pale brown and yellow brown often weakly cemented slightly silty fine to medium SAND with occasional orange-brown mottling. (BLOWN SAND)		(1.30)	
								6.00 *4.65*	
		6.00	SPTc	N=39	dry	Dense slightly damp pale brown orange-brown and pale red-brown mottled weakly cemented slightly silty fine/medium SAND with closely spaced pale yellow-brown fine sand horizons. (BLOWN SAND)			
						Below 6.70 m depth predominantly pale brown and grey-brown becoming very dense below 7.05 m depth.		(1.24)	
		6.90	SPTc	N=50/190	dry				
						End of Exploratory Hole		**7.24** *3.41*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.00	Inspection Pit									101	1.00	116	5.00			
1.00	7.24	Dynamic Sampled									101	2.00					
											101	3.00					
											101	4.00					
											101	5.00					
											87	6.00					
											76	6.90					

Remarks
Terminated at scheduled depth.
No installation backfilled with bentonite pellets.

Termination Depth: 7.24m

HCL House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINTGINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:45:00

Windowless Sample Log

WS146

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.61**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274707.7**	**189478.9**	**18-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
0.15-0.20	ES1					Black BITUMINOUS paving.		*10.56*	
								0.05 *10.43*	
0.30-0.50	ES2					MADE GROUND: Dark grey slightly silty sandy GRAVEL of subangular to irregular slag and sandstone.		*10.31*	
								0.18	
0.60-0.70	ES3					MADE GROUND: Firm dark grey-black slightly sandy gravelly CLAY with rare cobbles. Gravel and cobbles are subangular flat/elongate mudstone.		(0.45)	
								0.30 *9.86*	
0.90-1.00	ES4					MADE GROUND: Dark grey and red purple-brown very sandy GRAVEL of irregular aerated low density slag, clinker and occasional brick.		**0.75** *9.61*	
		1.00	SPTc	N=16	dry	MADE GROUND: Pale greenish grey to brown and occasionally dark grey veined slightly silty fine to medium SAND. Occasional coarse sand to fine gravel size carbonaceous mudstone and coal fragments.		**1.00**	
1.20-1.30	B5					Medium dense pale brown yellow-brown locally slightly silty fine to medium SAND with rare thin (2 mm) dark grey veins and rare fine gravel size angular flat mudstone fragments. (BLOWN SAND)		(1.00)	
		2.00	SPTc	N=8	dry	Loose pale yellow-brown fine to medium SAND with closely spaced irregular pale grey-brown veining. (BLOWN SAND)		**2.00** *8.61* (0.45) **2.45** *8.16*	
2.50-3.00	B6					Loose pale brown and pale orange-brown weakly cemented slightly silty fine to medium SAND with occasional grey slightly organic inclusions. (BLOWN SAND)			
		3.00	SPTc	N=9	dry	Organic inclusions absent below 3.00m depth. Becoming medium dense towards 4.00m depth.		(3.00)	
4.00-5.00	B7								
		4.00	SPTc	N=21	dry				
		5.00	SPTc	N=22	dry				
						End of Exploratory Hole		**5.45** *5.16*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00	1.10	Inspection Pit									101	1.00	116	1.00			
1.10	5.45	Dynamic Sampled									87	2.00					
											87	3.00					
											77	4.00					
											66	5.45					

Remarks

Terminated at scheduled depth.
Installation: Flush cover set in concrete. 50 mm OD plain pipe GL to 1.0 m then slotted pipe to 5.0 m. Gravel filter material 1.0 m to 5.45 m

Termination Depth: 5.45m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:45:01

Windowless Sample Log

WS147

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.63**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274713.5**	**189544.4**	**18-02-15**	**1:50**

SAMPLES		TESTS			Water Strikes	STRATA			Install/ Backfill
Depth	Type/ No.	Depth	Type/ No.	Results		Description	Legend	**Depth**, *Level* (thickness)	
						Black BITUMINOUS paving.		*10.54*	
0.20-0.30	ES1					MADE GROUND: Grey slightly sandy GRAVEL. Sand is partly reworked soil and partly ash based. Gravel is fine to coarse crushed clinker, brick, slag and concrete.		**0.09** *10.25*	
0.50-0.60	ES2					MADE GROUND: Pale brown and green-brown slightly silty sligly gravelly fine to medium SAND. Gravel comprises medium to coarse subangular sandstone gravel in upper part (to 0.50m depth) and fine to coarse subangular flat mudstone gravel throughout layer, clasts are often surrounded by grey-brown discolouration.		**0.38**	
0.70-1.00	B3							**0.69** *9.94*	
1.00-1.20	ES4	1.00	SPTc	N=11	dry	Loose to medium dense pale brown yellow brown locally slightly silty fine to medium SAND with rare thin (<2mm) irregular dark grey veins and rare fine subangular mudstone gravel. (BLOWN SAND)		(2.11)	
		2.00	SPTc	N=9	dry				
								2.80 *7.83*	
3.00-3.50	B5	3.00	SPTc	N=14	dry	Medium dense pale brown locally slightly silty fine to coarse SAND with closely spaced orange-brown fine to coarse sand laminations. (BLOWN SAND)			
		4.00	SPTc	N=18	dry			(2.65)	
		5.00	SPTc	N=22	dry				
						End of Exploratory Hole		**5.45** *5.18*	

DRILLING TECHNIQUE			CHISELLING			WATER OBSERVATIONS					HOLE/CASING DIAMETER				WATER ADDED		
From	To	Technique	Hard Strata From	Hard Strata To	Time	Date/Time	Strike At	Rise To	Casing	Sealed	Hole Dia.	Depth	Casing Dia.	Depth	From	To	Volume (ltr)
0.00 1.00	1.00 5.45	Inspection Pit Dynamic Sampled									101 87 87 77 66	1.00 2.00 3.00 4.00 5.45	116	1.00			

Remarks

Terminated at scheduled depth.
Installation: Flush cover set in concrete. 50 mm OD plain pipe GL to 1.0 m then slotted pipe to 5.0 m. Gravel filter material 1.0 m to 5.45 m

Termination Depth: 5.45m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:45:01

Windowless Sample Log

WS148

Project	Project No.	Ground Level (m AOD)	Start Date	Sheet
Afan Lido	**UA007442-04**	**10.46**	**18-02-15**	**1 of 1**
Client	**Easting (OS)**	**Northing (OS)**	**Finish Date**	**Scale**
Neath Port Talbot County Borough Council	**274596.3**	**189556.2**	**18-02-15**	**1:50**

SAMPLES Depth	SAMPLES Type/ No.	TESTS Depth	TESTS Type/ No.	TESTS Results	Water Strikes	STRATA Description	Legend	Depth, *Level* (thickness)	Install/ Backfill
0.20-0.30	ES1					TOPSOIL comprising brown silty slightly gravelly CLAY with occasional thin roots and plant remains.		**0.30** *10.16*	
0.30-0.45	ES2					MADE GROUND: Firm orange brown slightly silty slightly gravelly CLAY with occasional thin roots and low cobble content. Gravel and cobbles are angular to subangular limestone.		**0.46** *10.00*	
0.50-0.60	ES3					MADE GROUND: Dark greenish grey clayey silty sandy GRAVEL. Silt and sand are partially reworked soil and partially ash-based. Gravel is fine to medium crushed clinker, occasional brick, pottery and charred paper fragments (ash, reworked soil). Yellow plastic fragments (old plastic container) at base of layer.		**0.67** *9.79*	
0.70-1.00	B4								
0.80-1.10	ES5	1.00	SPTc	N=31	dry	Medium dense greenish grey and dark grey mottled silty fine to medium SAND with frequent dark grey clayey veins becoming dark grey slightly sandy gravel of angular flat to elongate mudstone, with very closely spaced thin (10 mm) laminations of green grey silty sand: proportion of sand horizons reducing with depth. (BLOWN SAND?)		**1.00** *9.46*	
1.50-2.00	B6							(1.15)	
		2.00	SPTc	N=10	dry	Medium dense pale brown and locally yellow-brown slightly silty fine to medium SAND. (BLOWN SAND)		**2.15** *8.31*	
3.00-3.50	B7	3.00	SPTc	N=14	dry	Medium dense pale brown locally slightly silty fine to medium SAND with rare coarse sand to fine gravel size dark grey mudstone fragments. (BLOWN SAND)			
		4.00	SPTc	N=13	dry			(3.28)	
		5.00	SPTc	N=50/275	dry				
						End of Exploratory Hole		**5.43** *5.03*	

DRILLING TECHNIQUE From	To	Technique	CHISELLING Hard Strata From	To	Time	WATER OBSERVATIONS Date/Time	Strike At	Rise To	Casing	Sealed	HOLE/CASING DIAMETER Hole Dia.	Depth	Casing Dia.	Depth	WATER ADDED From	To	Volume (ltr)
0.00	1.20	Inspection Pit									101	1.00	116	1.00			
1.20	5.43	Dynamic Sampled									87	2.00					
											77	3.00					
											77	4.00					
											67	5.00					

Remarks

Terminated at scheduled depth.
Installation: Flush cover set in concrete. 50 mm OD plain pipe GL to 1.0 m then slotted pipe to 5.0 m. Gravel filter material 1.0 m to 5.43 m.

Termination Depth: 5.43m

HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

All depths in meters (unless otherwise stated)
All diameters in mm (unless otherwise stated)
Time is expressed hhmm (unless otherwise stated)

Equipment Used: **Dart Rig 224**

Contractor: **Hyder Consulting (UK) Ltd**

Logged By: **MWms**

Checked By: **GRW**

HYDER SITE INVESTIGATION SERVICES GINT LIBRARY VER 2.4 - 25-04-13 - REEVE.GLB Log SIS WINDOWLESS SAMPLE LOG Z:\GEOTECHNICS\GINT\GINT PROJECT FILES\UA007442 AFON LIDO\UA007442 AFON LIDO (18032015).GPJ AGS 3_1.GDT <<DrawingFileSpec>> 29/06/2015 14:45:02

Appendix C

Ground and Gas Monitoring

Water Levels

	25/02/2015 12:00-13:00	*27/02/2015 13:15-13:45*	*25/03/2015 9.30 - 11.00*	*25/03/2015 12.00-13.00*	*25/03/2015 12.00-13.00*	*09/04/2015*	*09/04/2015*	*25/05/2015*	*25/05/2015*
BH ID	**Water depth below cover level**	**Water depth below cover level**	**Water depth below cover level**	**Water depth below cover level**	**Well depth below cover level**	**Water depth below cover level**	**Well depth below cover level**	**Water depth below cover level**	**Well depth below cover level**
	(m)	**(m)**	**(m)**	**(m)**	**(m)**	**(m)**	**(m)**	**(m)**	**(m)**
BH101p	Installation covered over		NA	NA	NA	6.78	NA	-	-
BH101s	Installation covered over		Dry	Dry	6.08	dry	6.00	-	-
BH102p	Drilling in progress		-	-	-	-	-	-	-
BH102s	Drilling in progress		6.30	6.28	7.14	NA	NA	6.50	NA
BH103p			-	-	-	-	-		
BH103s	3.96	6.71	4.07	4.10	6.68	NA	NA	4.32	NA
WS143A	Dry	2.16	Dry	Dry	2.15	dry	2.10		
WS144	Dry	3.89	NA	NA	NA	NA	NA		
WS146	Dry	5.07	Dry	Dry	5.12	dry	5.00		
WS147	Dry	5.06	Dry	Dry	5.09	NA	NA		
WS148	Dry	5.14	Dry	Dry	5.15	NA	NA	Dry	5.15

Remarks

Date	*BH ID*	*Remarks*
27/02/2015 13:15-13:45	WS143A	Cover installed by MLW on 27/02/15 flush with ground level as surveyed.
27/02/2015 13:15-13:45	BH103s	Cover installed by drillers on 26/02/15, 0.035m above reference peg as surveyed.
27/02/2015 13:15-13:45	BH103s	Cover installed by drillers on 02/03/15 flush with reference peg as surveyed.
27/02/2015 13:15-13:45	BH103s	Cover installed by drillers on 02/03/15 flush with ground level as surveyed.
25/03/2015 9.30 - 11.00	WS144	Unable to open. Ridges in lock eroded away, key doesn't fit.
25/03/2015 9.30 - 11.00	BH103s	Sample taken and sent to i2
25/03/2015 9.30 - 11.00	BH102	Sample taken and sent to i2
09/04/2015	WS147	No access to well
09/04/2015	WS144	could not open
09/04/2015	WS148	No access to well
09/04/2015	BH103	No access to well
09/04/2015	BH102	No access to well

Gas Monitoring

BH ID	Determinand	Units	25/03/2015						09/04/2015						22/05/2015					
			Initial	Time (secs)					Initial	Time (secs)					Initial	Time (secs)				
			0	30	60	90	120	180	0	30	60	90	120	180	0	30	60	90	120	180
BH101s	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.5	19.4	-	19.4	19.3		19.2	19.1	19.1	19.1	19.1						
	CO2	%vol		0.8	0.9	-	0.9	0.9		1.1	1.1	1.1	1.1	1.1						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1009						1023											
BH102s	Flow Rate	l/hr	0.0												0.0					
	CH4	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		20.5	20.5	-	20.5	20.5								20.3	20.3	20.1	20.5	20.3
	CO2	%vol		0.1	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CO	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	H2S	ppm		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	Atmospheric	mbar	1011												1009					
BH103s	Flow Rate	l/hr	0.0												0.0					
	CH4	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		18.5	18.4	-	18.3	18.2								18.7	18.7	18.6	18.7	18.7
	CO2	%vol		1.2	1.3	-	1.3	1.4								1.0	1.0	1.1	1.2	1.1
	CO	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	H2S	ppm		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	Atmospheric	mbar	1010												1009					
WS143A	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.8	19.7		19.7	19.7		19.7	19.7	19.6	19.6	19.6						
	CO2	%vol		0.7	0.7	-	0.7	0.7		0.8	0.8	0.7	0.7	0.7						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1010						1023											
WS146	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.4	19.3	-	19.3	19.3		19.6	19.4	19.3	19.3	19.3						
	CO2	%vol		0.9	1.0	-	1.0	1.0		0.8	0.8	0.9	0.9	0.9						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1013						1023											
WS147	Flow Rate	l/hr	0.0						0.0											
	CH4	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.9	19.8	-	19.8	19.7		19.6	19.4	19.3	19.3	19.3						
	CO2	%vol		0.3	0.3	-	0.3	0.4		0.8	0.8	0.9	0.9	0.9						
	CO	%vol		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	H2S	ppm		0.0	0.0	-	0.0	0.0		0.0	0.0	0.0	0.0	0.0						
	Atmospheric	mbar	1010						1023											
WS148	Flow Rate	l/hr	0.0												0.0					
	CH4	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	CH4 LEL	% LEL		-	-	-	-	-												
	O2	%vol		19.5	19.3	-	19.3	19.3								19.8	19.8	19.6	19.6	19.6
	CO2	%vol		0.0	0.0	-	0.0	0.0								0.7	0.7	0.8	0.8	0.8
	CO	%vol		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	H2S	ppm		0.0	0.0	-	0.0	0.0								0.0	0.0	0.0	0.0	0.0
	Atmospheric	mbar	1013												1009					

Appendix D

Geotechnical Laboratory Results

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 25981

Client's Reference: **UA007442-4**

Report Date: **16-03-2015**

Client **Hyder Consulting Limited**
HCL House
St Mellons Business Park
St Mellons
Cardiff
CF3 0EY

Contract Title: **Afon Lido**

For the attention of: **Oliver Neal Wells**

Date Received: **19-02-2015**

Date Commenced: **19-02-2015**

Date Completed: **16-03-2015**

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	33
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	6
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 - * UKAS	18
PSD: Sedimentation by pipette carried out with Wet Sieve 1377 : 1990 Part 2 : 9.4 - * UKAS	1
PSD: Sedimentation by pipette carried out separately 1377 : 1990 Part 2 : 9.4 - * UKAS	2
(GI) BRE Suite Total Sulphate, Aqueous Sulphate, Total Sulphur, Aqueous Nitrate, Aqueous Mag, Chloride, 1377 : 1990 Part 3 & BRE CP2/79 - @ Non Accredited Test	3

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

Laboratory Report

2788

GEO Site & Testing Services Ltd

Contract Number: 25981

Test Description	Qty
pH Value of Soil 1377 : 1990 Part 3 : 9 - @ Non Accredited Test	12
Water Soluble Sulphate 2:1 extract 1377 : 1990 Part 3 : 5 - @ Non Accredited Test	12
Loss on Ignition 1377 : 1990 Part 3 : 4 - @ Non Accredited Test	5
Determination of the Total Sulphur content of Soil 1377 : 1990 BRE Dependant Options - @ Non Accredited Test	9
Chloride Content 1377 : 1990 Part 3 : 7 - @ Non Accredited Test	9
One-dimensional Consolidation 75mm or 50mm diameter specimens (5 days) 1377 : 1990 Part 5 : 3 - * UKAS	4
Quick Undrained Triaxial Compression test - single specimen at one confining pressure (100mm or 38mm diameter) 1377 : 1990 Part 7 : 8 - * UKAS	4
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
- denotes test carried out by approved contractor
@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:
Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)
Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd
Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

Client ref: UA007442-04

Location: Afon Lido

Contract Number: 25981-020315

Hole Number	Sample Number	Type	Depth (m)	Description of Sample*
BH101	1	B	1.00 - 1.20	Brown clayey silty SAND
BH101	5	B	2.90 - 3.20	Brown SAND
BH101	9	B	4.90 - 5.20	Brown SAND
BH101	26	UT	17.00 - 17.45	Grey silty CLAY
BH101	31	UT	19.50 - 19.95	Grey silty CLAY
BH103	36	UT	18.50 - 18.95	Brown silty CLAY
BH103	51	B	28.70 - 29.00	Grey clayey SILT
TP121	2	B	0.35	Brown gravelly (fine-coarse) clayey SILT
TP122	6	B	1.30	Brown SAND
TP123	3	B	0.30	Brown gravelly (fine-medium) SAND
TP125	3	B	0.20	Grey gravelly (fine-coarse) SILT
TP126	1	B	0.05	Brown sandy SILT
TP127	4	B	0.50	Brown silty CLAY
TP133	2	B	0.25	Brown silty CLAY
TP134	3	B	0.40	Brown gravelly (fine-medium) SAND
TP135	6	B	1.00	Brown SAND

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory

GSTL
GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jonathan Tatam (Admin/Quality Assistant)

Date: 16.3.15

UKAS TESTING
2788

Client ref: UA007442-04

Location: Afon Lido

Contract Number: 25981-020315

Hole Number	Sample Number	Type	Depth (m)	Description of Sample*
WS141	1	B	0.10 - 1.00	Brown SAND
WS141	6	B	2.50 - 3.00	Brown SAND
WS142	4	B	1.10 - 1.50	Brown SAND
WS143	2	B	0.40 - 0.75	Brown SAND
WS143	6	B	1.40 - 2.00	Brown SAND
WS144	6	B	1.00 - 1.50	Brown SAND
WS145	3	B	0.75 - 1.20	Brown SAND
WS145	6	B	3.50 - 4.00	Brown SAND
WS146	5	B	1.20 - 1.30	Brown silty clayey SAND
WS147	3	B	0.70 - 1.00	Brown gravelly (fine-medium) SAND
WS148	4	B	0.70 - 1.00	Grey gravelly (fine-medium) SAND
WS148	7	B	3.00 - 3.50	Brown SAND

Note: Results on this table are in summary format and may not meet the requirements of the relevant standards, additional information is held by the laboratory

GSTL
GEO SITE & TESTING SERVICES LTD

For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jonathan Tatam (Admin/Quality Assistant)

Date: 16.3.15

UKAS TESTING 2788

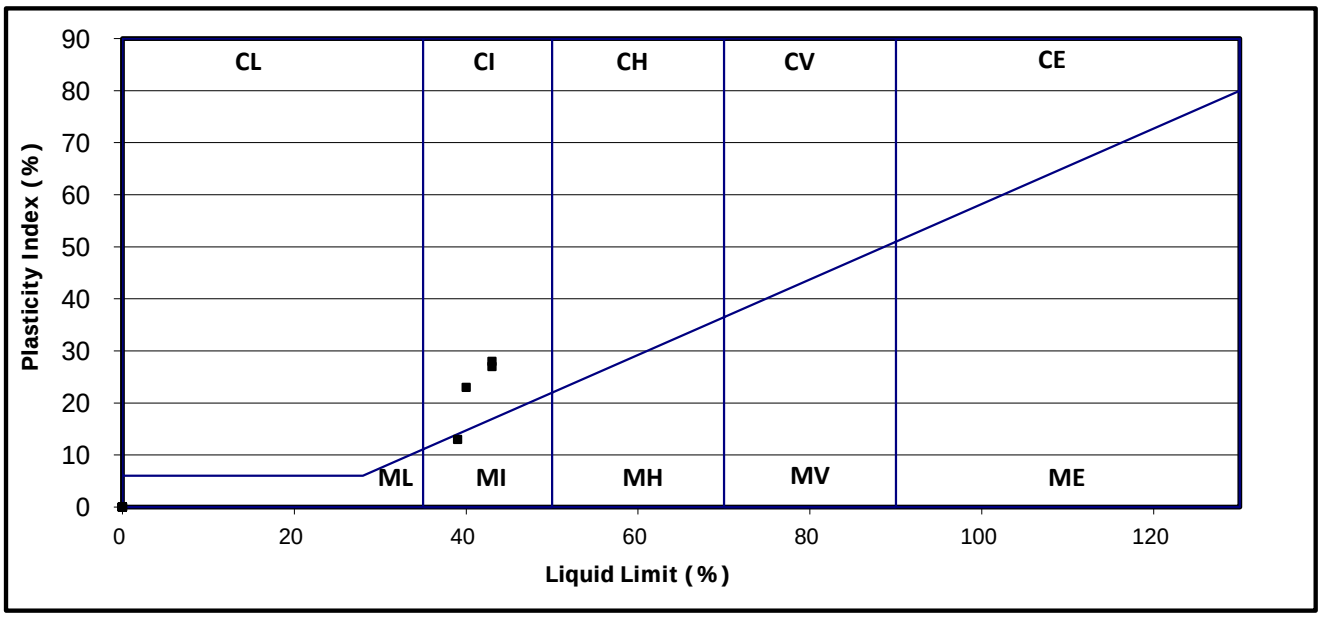
Test Report: **Method of the Determination of the plastic limit and plasticity index**
BS 1377 : Part 2 : 1990 Method 5

Client ref: **UA007442-04**
Location: **Afon Lido**
Contract Number: **25981-020315**

Hole / Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
BH101/1	B	1.00 - 1.20	19					
BH101/5	B	2.90 - 3.20	23					
BH101/9	B	4.90 - 5.20	25					
BH101/26	UT	17.00 - 17.45	27	40	17	23	100	CI Intermediate Plasticity
BH101/30	B	18.00 - 18.70	33		NP		100	
BH101/31	UT	19.50 - 19.95	27	43	16	27	100	CI Intermediate Plasticity
BH102/24	UT	15.50	23	39	26	13	98	MI Intermediate Plasticity
BH103/36	UT	18.50 - 18.95	29	43	15	28	100	CI Intermediate Plasticity
BH103/51	B	28.70 - 29.00	44		NP		100	
TP121/2	B	0.35	49					
TP122/6	B	1.30	5.1					
TP123/3	B	0.30	25					
TP125/3	B	0.20	10					
TP126/1	B	0.05	15					
TP127/4	B	0.50	23					
TP133/2	B	0.25	14					
TP134/3	B	0.40	6.2					
TP135/6	B	1.00	14					

Symbols: **NP : Non Plastic** **# : Liquid Limit and Plastic Limit Wet Sieved**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jonathan Tatam (Admin/Quality Assistant)
Date: 16.3.15

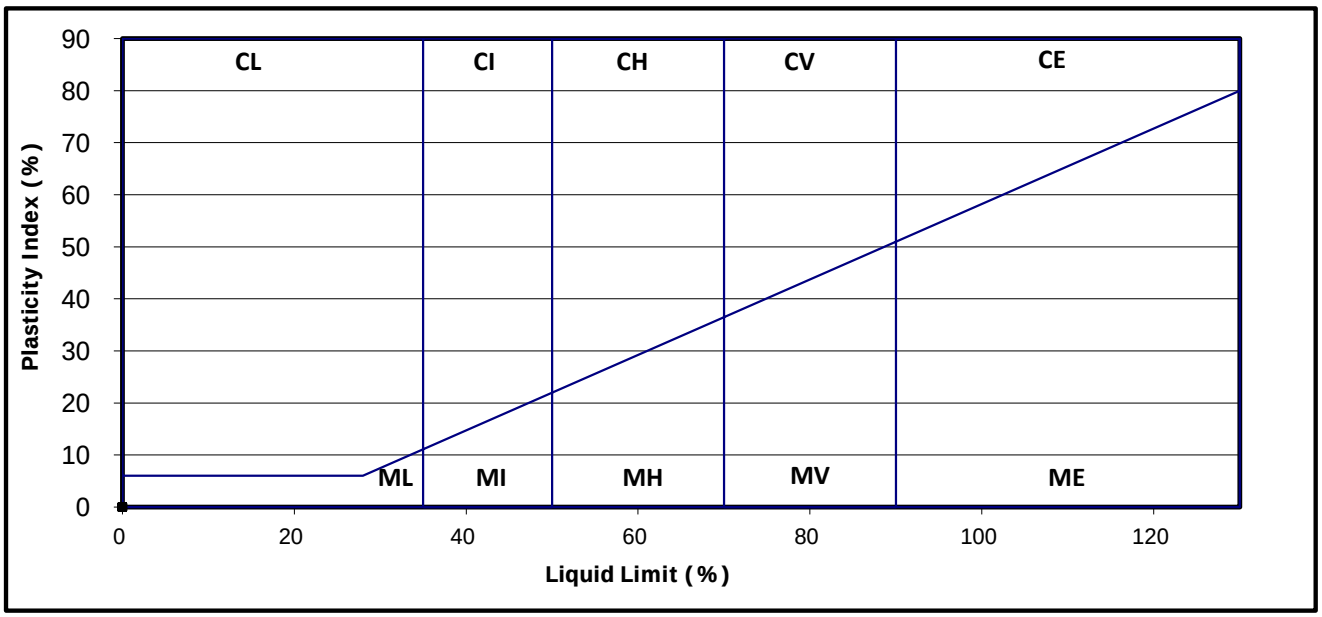
Test Report: **Method of the Determination of the plastic limit and plasticity index**
BS 1377 : Part 2 : 1990 Method 5

Client ref: **UA007442-04**
Location: **Afon Lido**
Contract Number: **25981-020315**

Hole / Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3/4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
WS141/1	B	0.10 - 1.00	10					
WS141/6	B	2.50 - 3.00	4.1					
WS141/7	B	3.50 - 4.00	9.3					
WS142/4	B	1.10 - 1.50	6.9					
WS143/2	B	0.40 - 0.75	11					
WS143/6	B	1.40 - 2.00	8.4					
WS144/6	B	1.00 - 1.50	11					
WS144/8	B	3.50 - 4.00	8.9					
WS145/3	B	0.75 - 1.20	4.6					
WS145/6	B	3.50 - 4.00	5.9					
WS146/5	B	1.20 - 1.30	13					
WS146/7	B	4.00 - 5.00	10					
WS147/3	B	0.70 - 1.00	22					
WS148/4	B	0.70 - 1.00	11					
WS148/7	B	3.00 - 3.50	13					

Symbols: **NP : Non Plastic** **# : Liquid Limit and Plastic Limit Wet Sieved**

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.
BS 5930:1999+A2:2010



For and behalf of GEO Site & Testing Services Ltd

Authorised By:
Jonathan Tatam (Admin/Quality Assistant)
Date: 16.3.15

Test Report: **Particle Size Distribution Test**

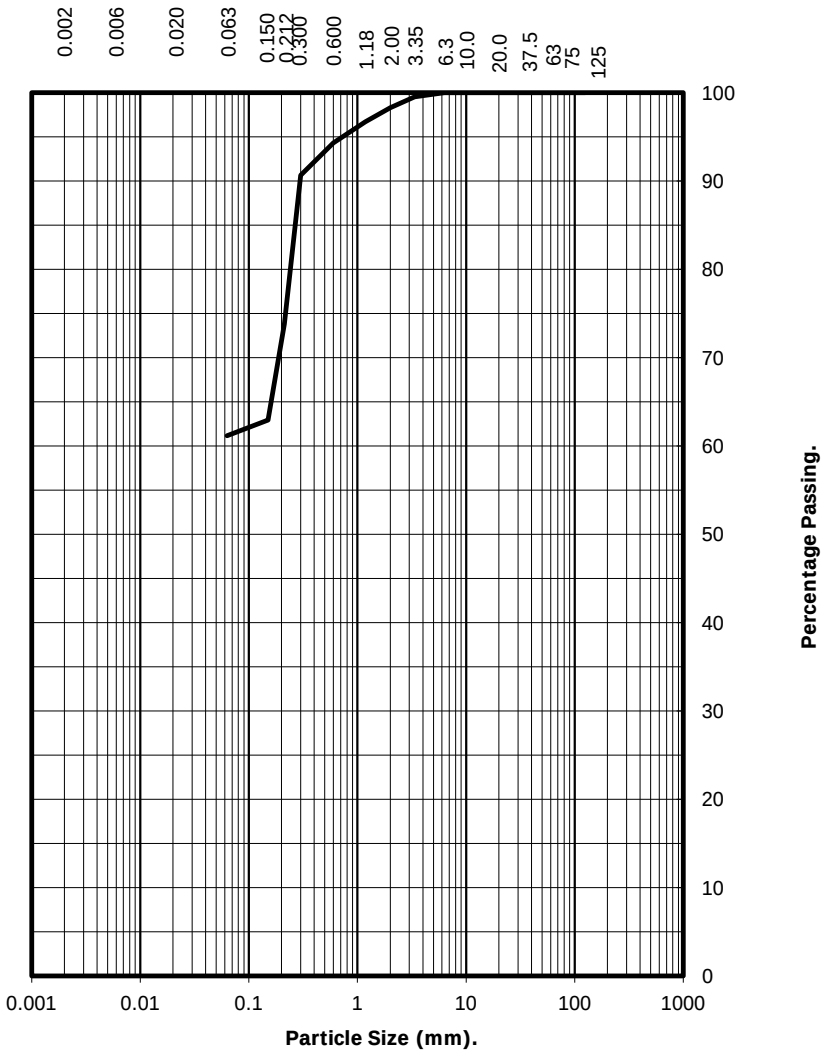
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH101**
Sample Number:	**15**
Depth from (m):	**8.30**
Depth to (m):	**8.60**
Sample Type:	**B**
Description:	**Brown gravelly (fine) sandy silty CLAY**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	98
1.18	97
0.60	94
0.300	91
0.212	74
0.150	63
0.063	61

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	61	**37**	**2**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 10.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

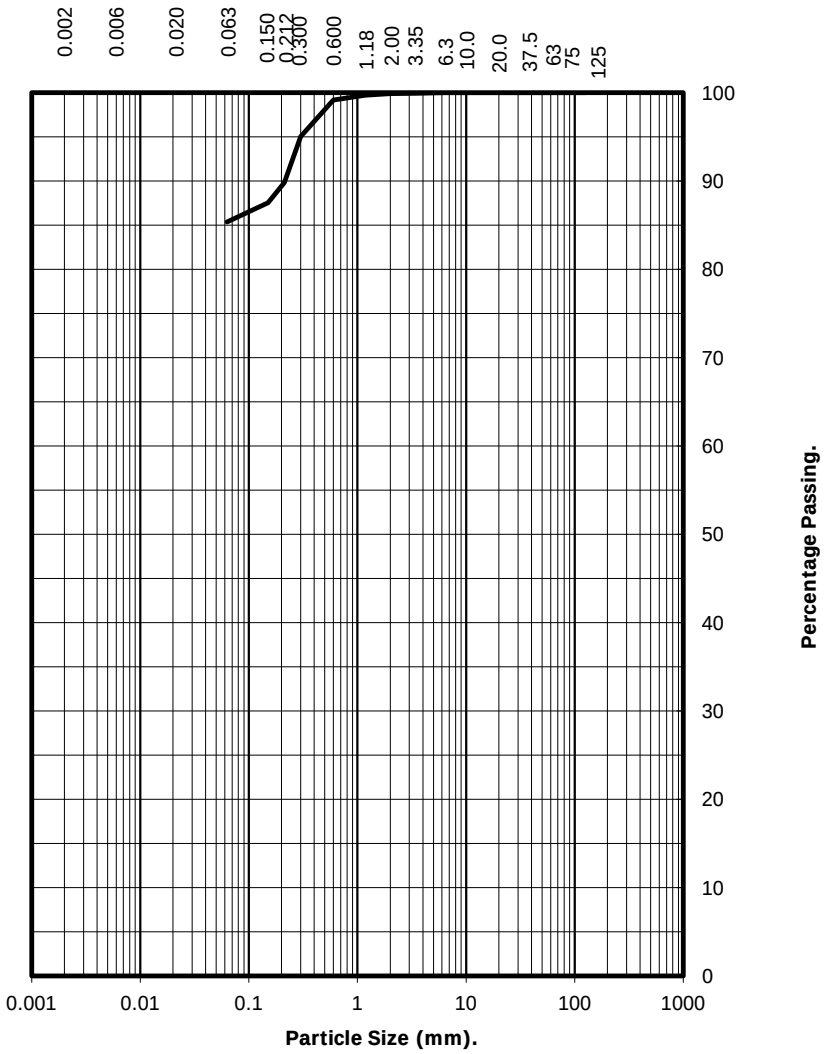
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH101**
Sample Number:	**30**
Depth from (m):	**18.00**
Depth to (m):	**18.70**
Sample Type:	**B**
Description:	**Brown/grey sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	99
0.300	95
0.212	90
0.150	88
0.063	85

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	85	**15**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 16.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

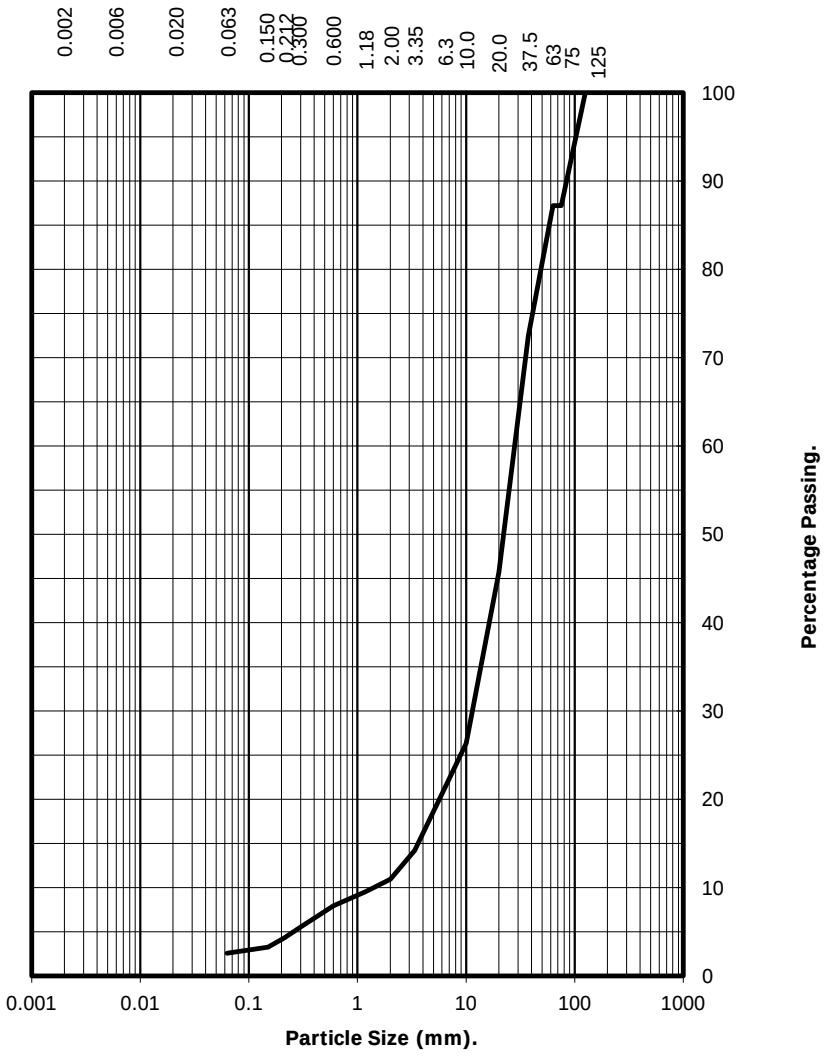
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH101**
Sample Number:	**38**
Depth from (m):	**23.80**
Depth to (m):	**24.10**
Sample Type:	**B**
Description:	**Brown/grey silty clayey sandy GRAVEL (fine-coarse) with many cobbles**

BS Test Sieve	Percentage Passing
125	100
75	87
63	87
37.5	72
20	46
10	26
6.3	21
3.35	14
2.00	11
1.18	10
0.60	8
0.300	6
0.212	4
0.150	3
0.063	3

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	3	**8**	**76**	**13**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 10.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

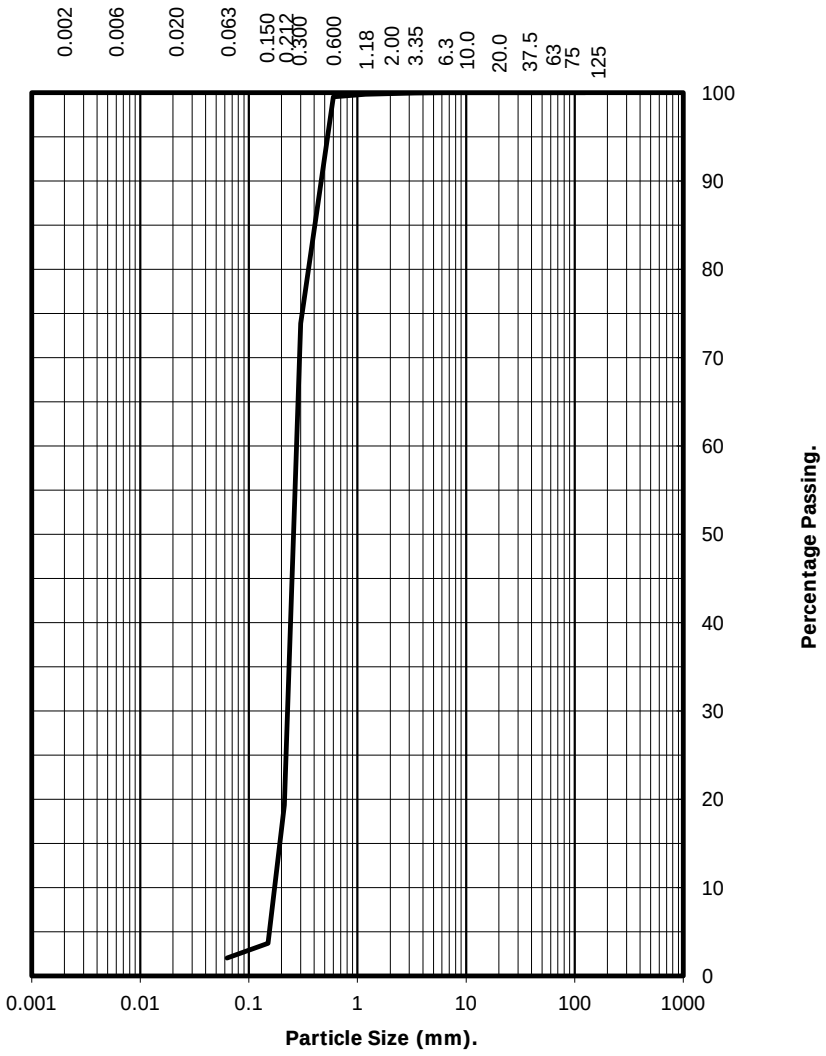
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH102**
Sample Number:	**16**
Depth from (m):	**9.40**
Depth to (m):	
Sample Type:	**B**
Description:	**Brown silty clayey SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	74
0.212	19
0.150	4
0.063	2

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	**98**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 10.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

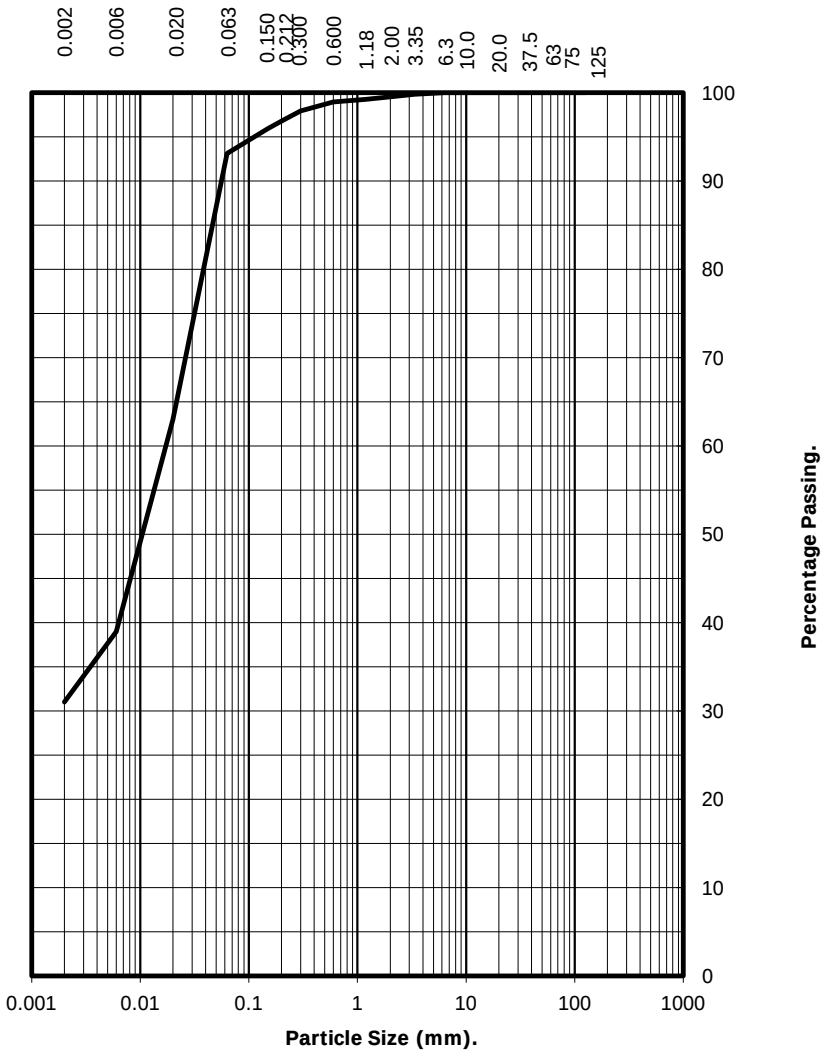
BS 1377 Part 2:1990.

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH102**
Sample Number:	**24**
Depth from (m):	**15.50**
Depth to (m):	
Sample Type:	**UT**
Description:	**Brown sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	99
0.60	99
0.300	98
0.212	97
0.150	96
0.063	93

Particle Diameter	Percentage Passing
0.02	63
0.006	39
0.002	31



Clay	Silt	Sand	Gravel	Cobbles	Soil Fraction
31	**62**	**7**	**0**	**0**	Total Percentage

Remarks:

Cl 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

GSTL GEO SITE & TESTING SERVICES LTD

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Tatam

Date: 12.3.15

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

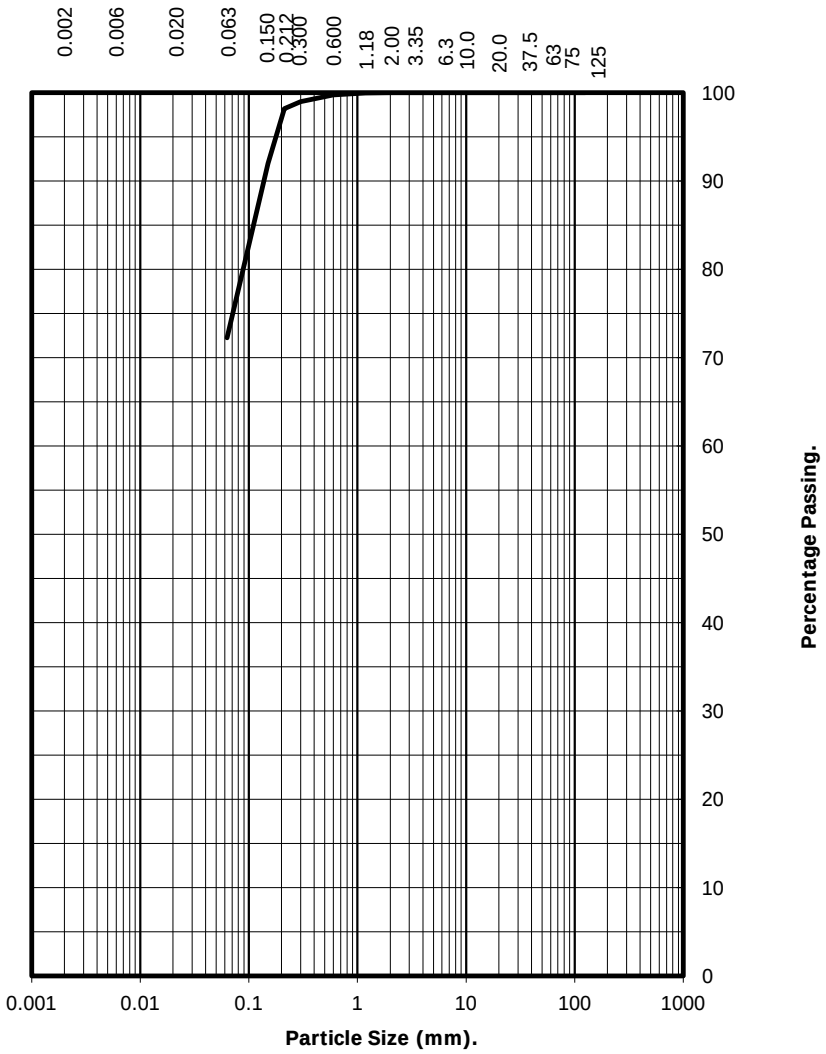
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH102**
Sample Number:	**29**
Depth from (m):	**19.90**
Depth to (m):	
Sample Type:	**B**
Description:	**Brown sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	99
0.212	98
0.150	92
0.063	72

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	72	**28**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

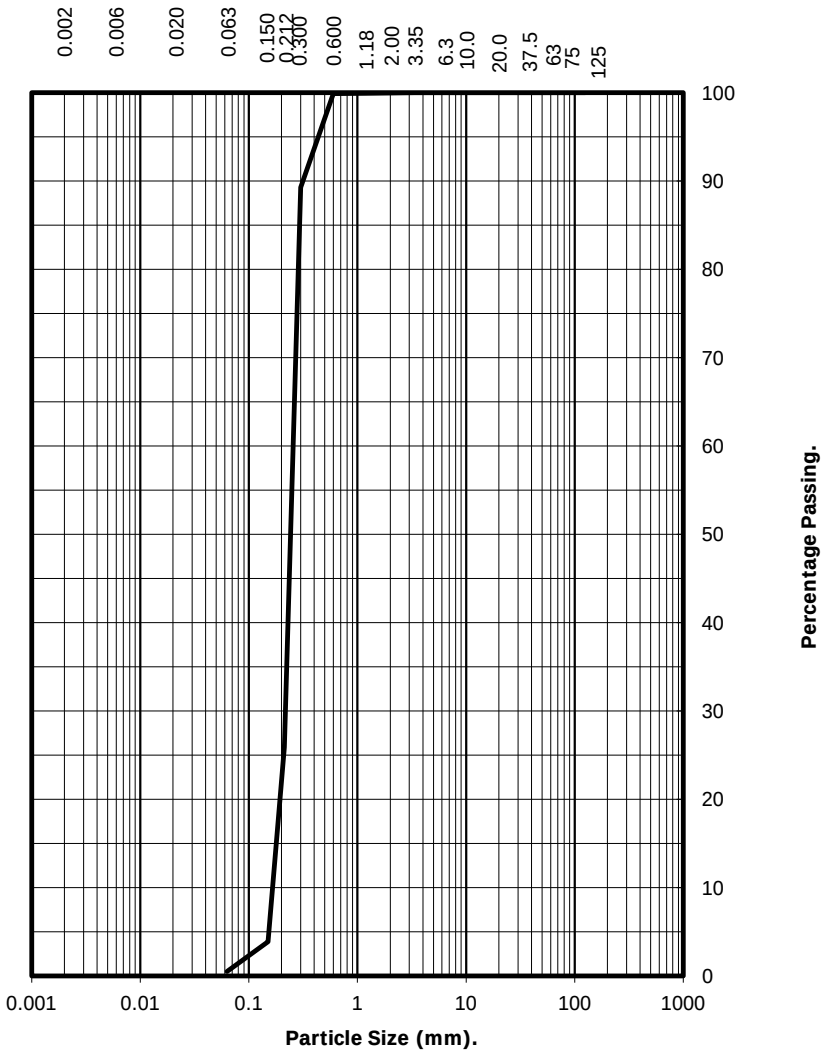
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH103**
Sample Number:	**9**
Depth from (m):	**2.75**
Depth to (m):	**3.00**
Sample Type:	**B**
Description:	**Brown SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	89
0.212	26
0.150	4
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	**100**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

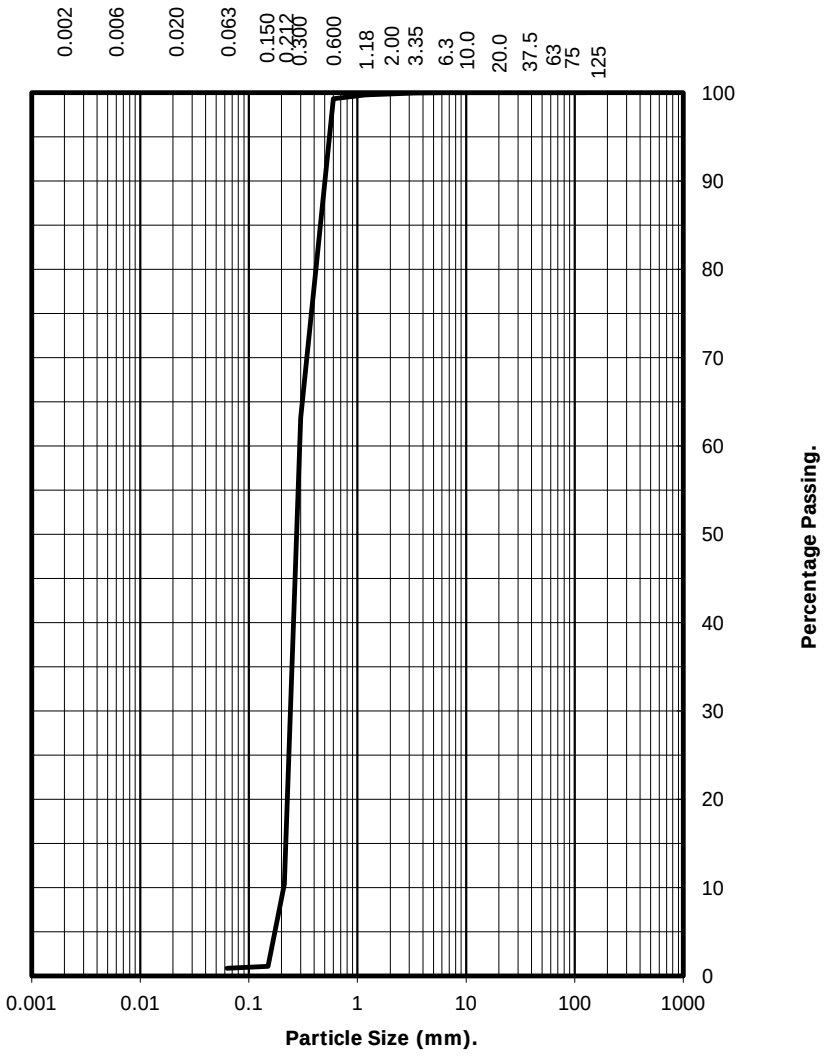
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH103**
Sample Number:	**23**
Depth from (m):	**9.50**
Depth to (m):	**10.00**
Sample Type:	**B**
Description:	**Brown silty SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	99
0.300	63
0.212	10
0.150	1
0.063	1

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	1	**99**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

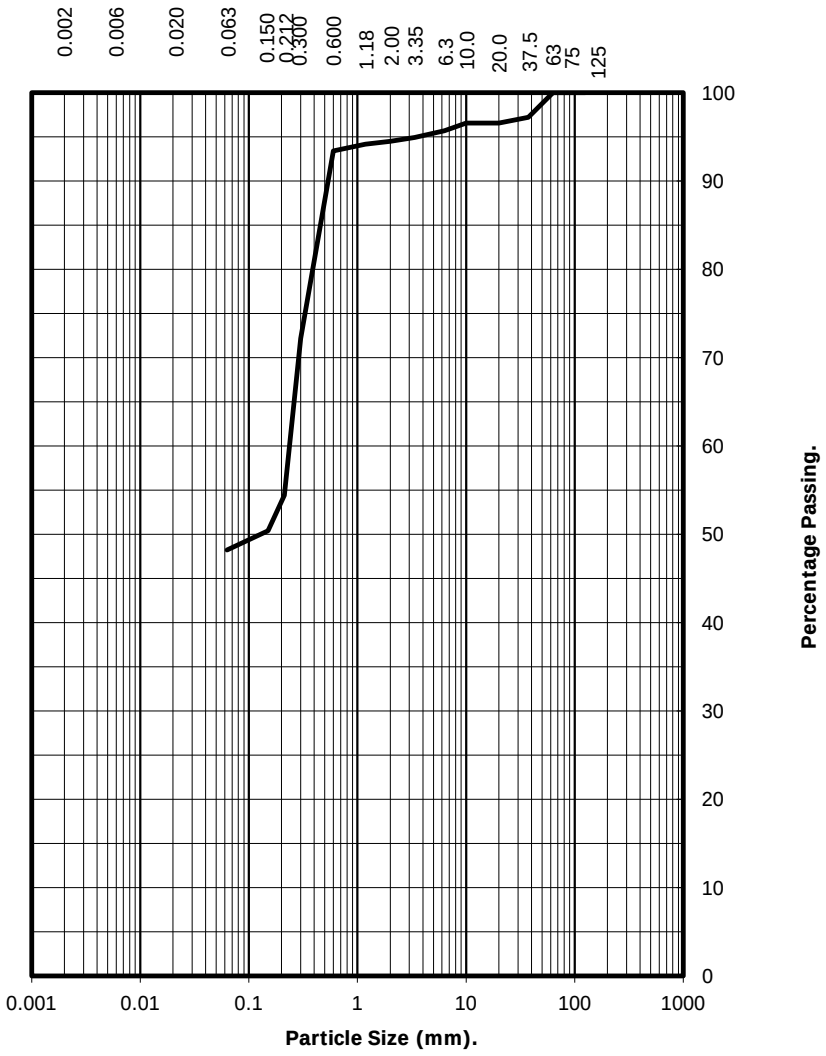
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH103**
Sample Number:	**27**
Depth from (m):	**11.60**
Depth to (m):	**12.50**
Sample Type:	**B**
Description:	**Brown gravelly (fine-coarse) sandy clayey SILT**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	97
20	97
10	97
6.3	96
3.35	95
2.00	95
1.18	94
0.60	93
0.300	72
0.212	54
0.150	50
0.063	48

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	48	**47**	**5**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

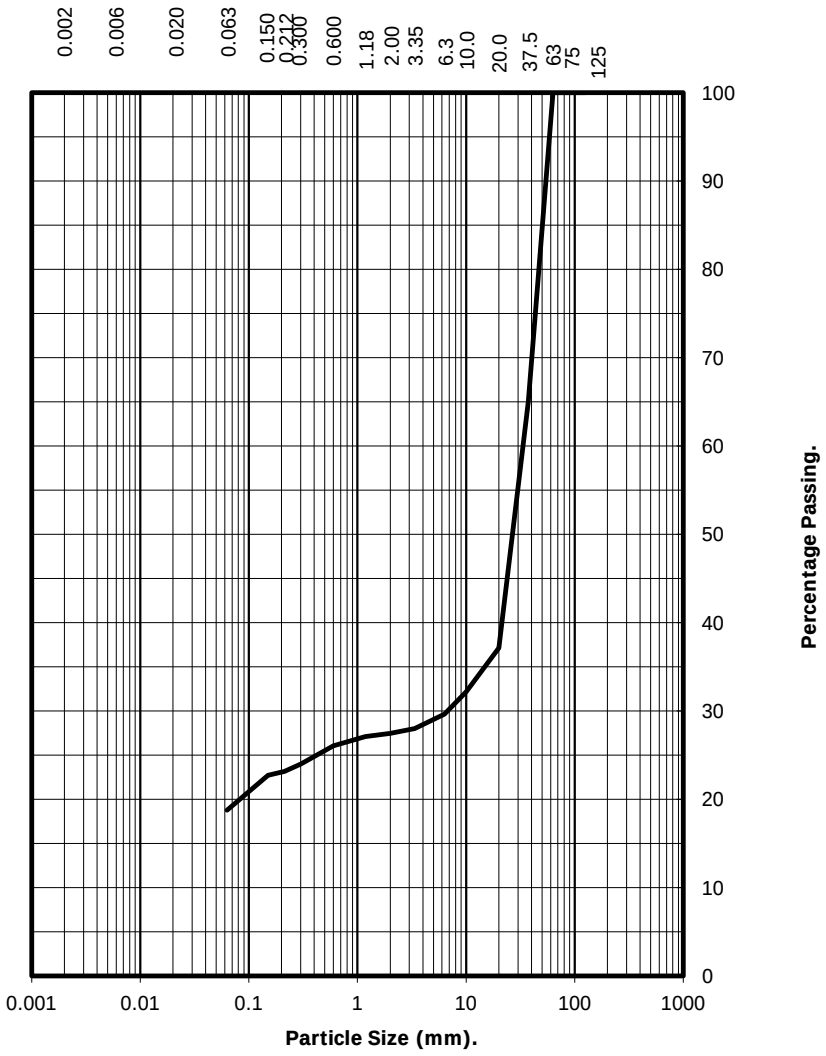
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH103**
Sample Number:	**39**
Depth from (m):	**20.45**
Depth to (m):	**21.50**
Sample Type:	**B**
Description:	**Brown sandy silty clayey GRAVEL (fine-coarse)**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	65
20	37
10	32
6.3	30
3.35	28
2.00	27
1.18	27
0.60	26
0.300	24
0.212	23
0.150	23
0.063	19

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	19	**8**	**73**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

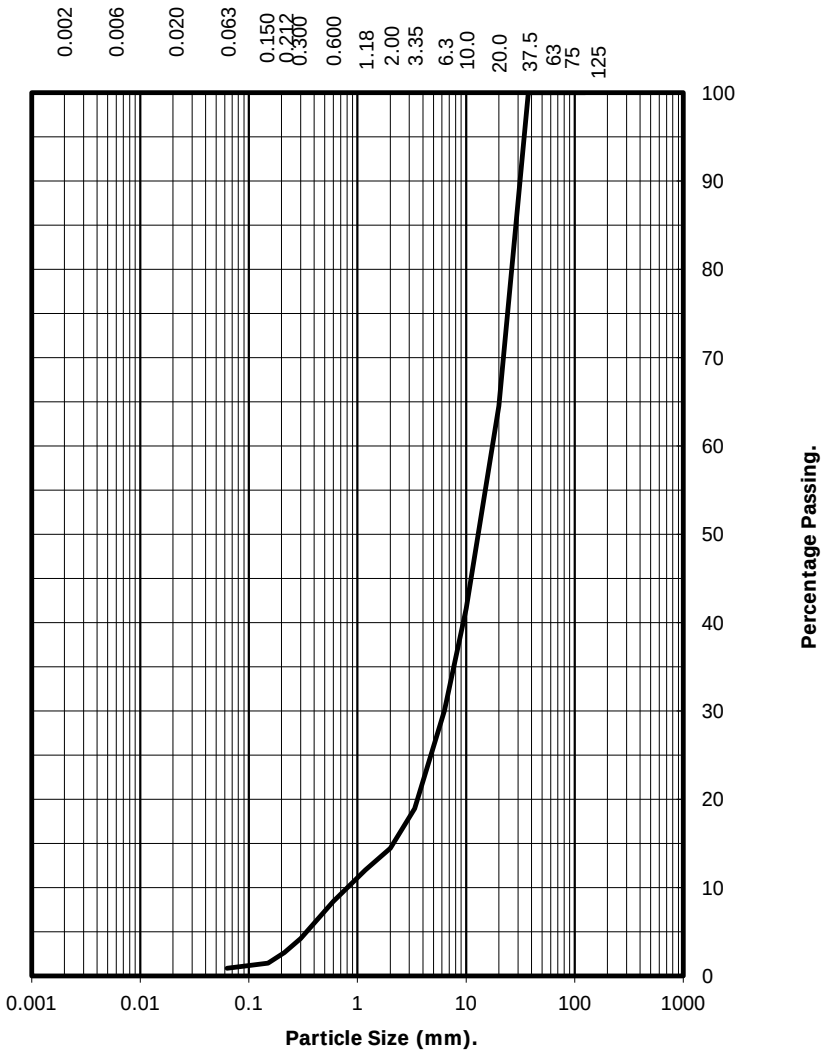
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**BH103**
Sample Number:	**46**
Depth from (m):	**25.70**
Depth to (m):	**26.00**
Sample Type:	**B**
Description:	**Brown silty sandy GRAVEL (fine-coarse)**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	65
10	42
6.3	30
3.35	19
2.00	14
1.18	12
0.60	8
0.300	4
0.212	3
0.150	1
0.063	1

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	1	**13**	**86**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

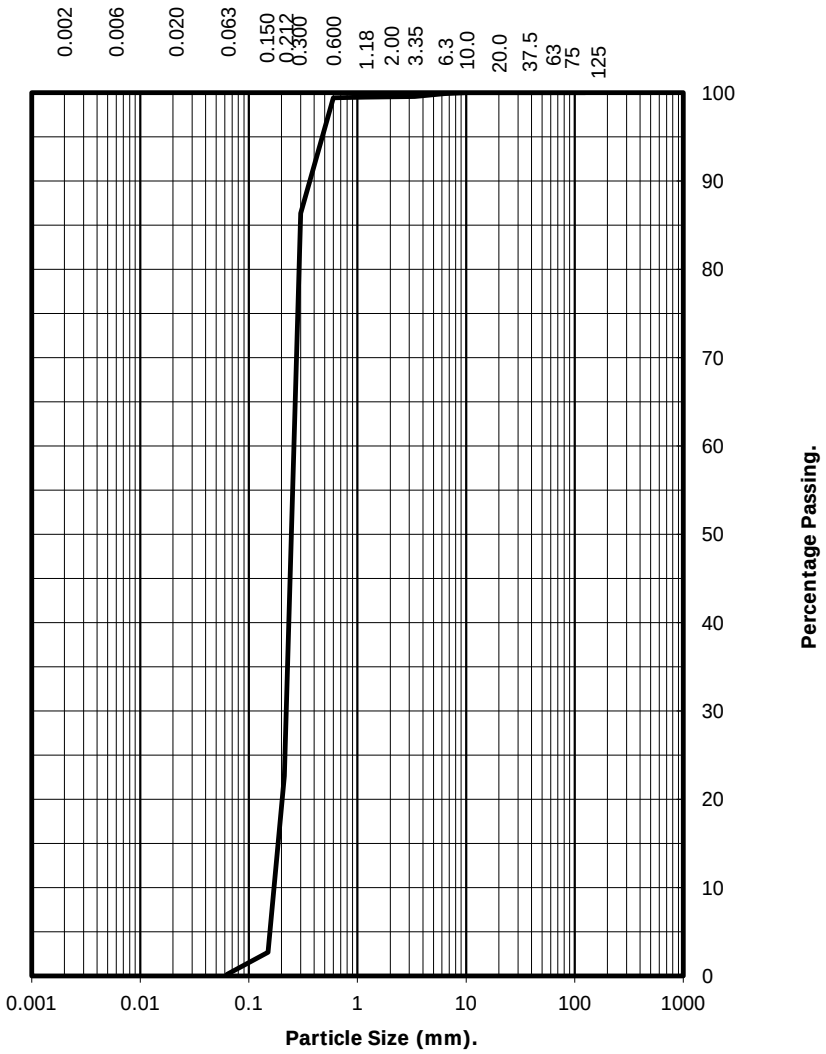
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**TP122**
Sample Number:	**7**
Depth from (m):	**2.00**
Depth to (m):	
Sample Type:	**B**
Description:	**Brown SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	99
0.60	99
0.300	86
0.212	23
0.150	3
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	**100**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

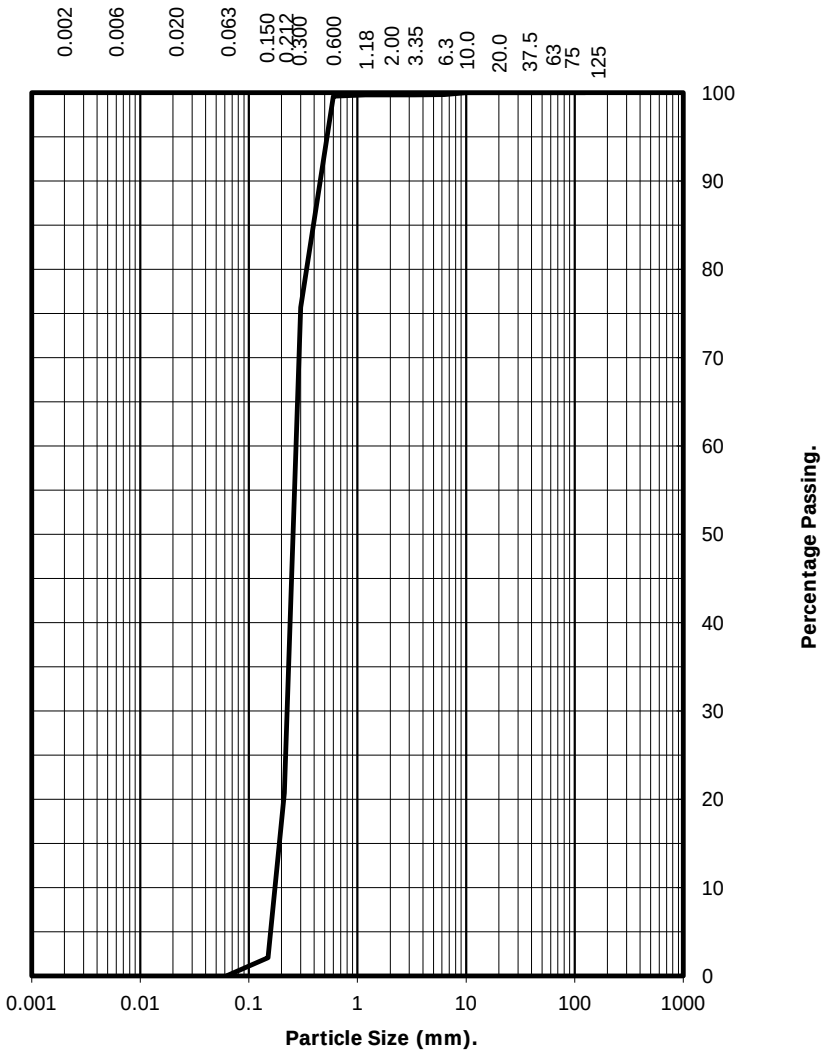
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**TP124**
Sample Number:	**7**
Depth from (m):	**2.60**
Depth to (m):	
Sample Type:	**B**
Description:	**Brown SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	76
0.212	21
0.150	2
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	**100**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 12.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

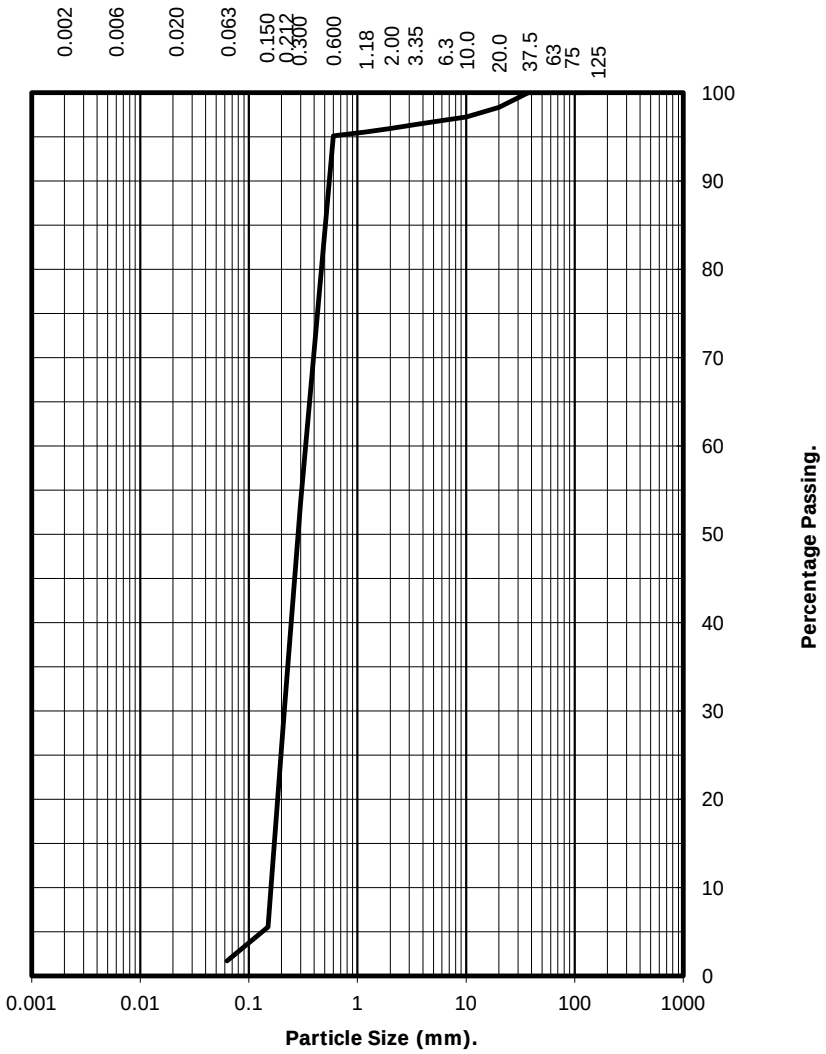
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**TP127**
Sample Number:	**9**
Depth from (m):	**2.80**
Depth to (m):	
Sample Type:	**B**
Description:	**Brown silty clayey gravelly (fine-coarse) SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	98
10	97
6.3	97
3.35	96
2.00	96
1.18	96
0.60	95
0.300	54
0.212	30
0.150	6
0.063	2

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	**94**	**4**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 13.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

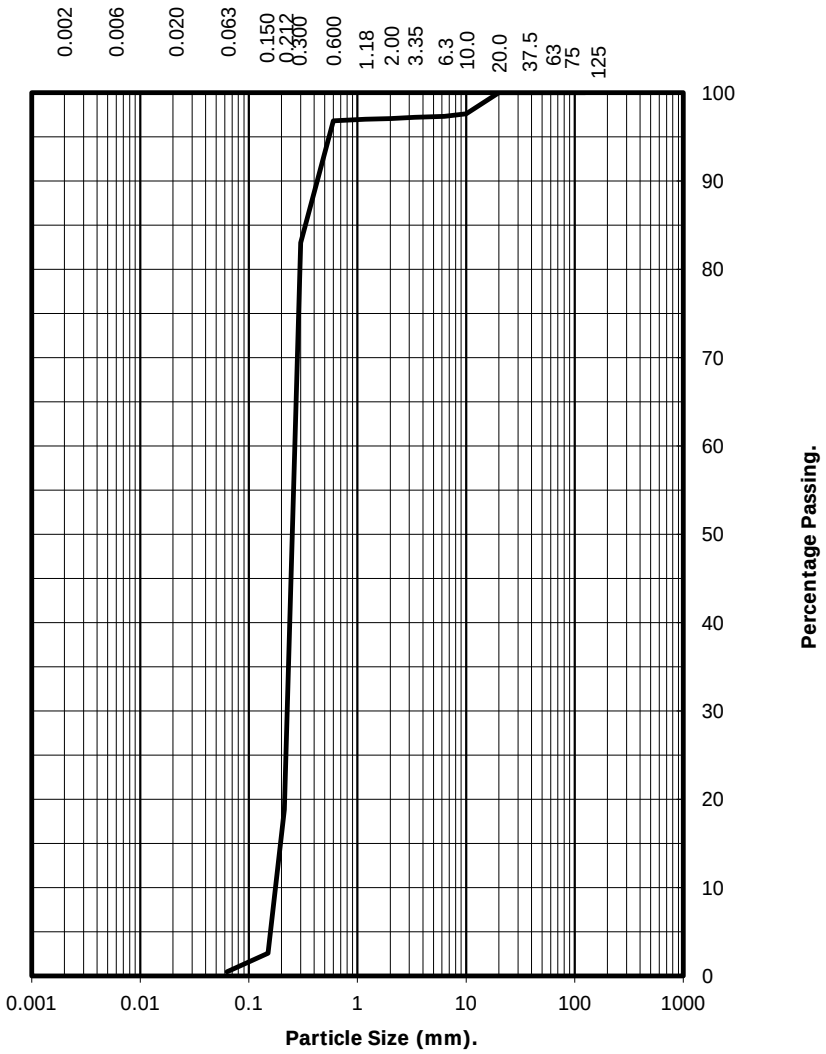
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**TP130**
Sample Number:	**7**
Depth from (m):	**2.50**
Depth to (m):	
Sample Type:	**B**
Description:	**Brown gravelly (fine-medium) SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	98
6.3	97
3.35	97
2.00	97
1.18	97
0.60	97
0.300	83
0.212	19
0.150	3
0.063	0

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	0	**97**	**3**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 13.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

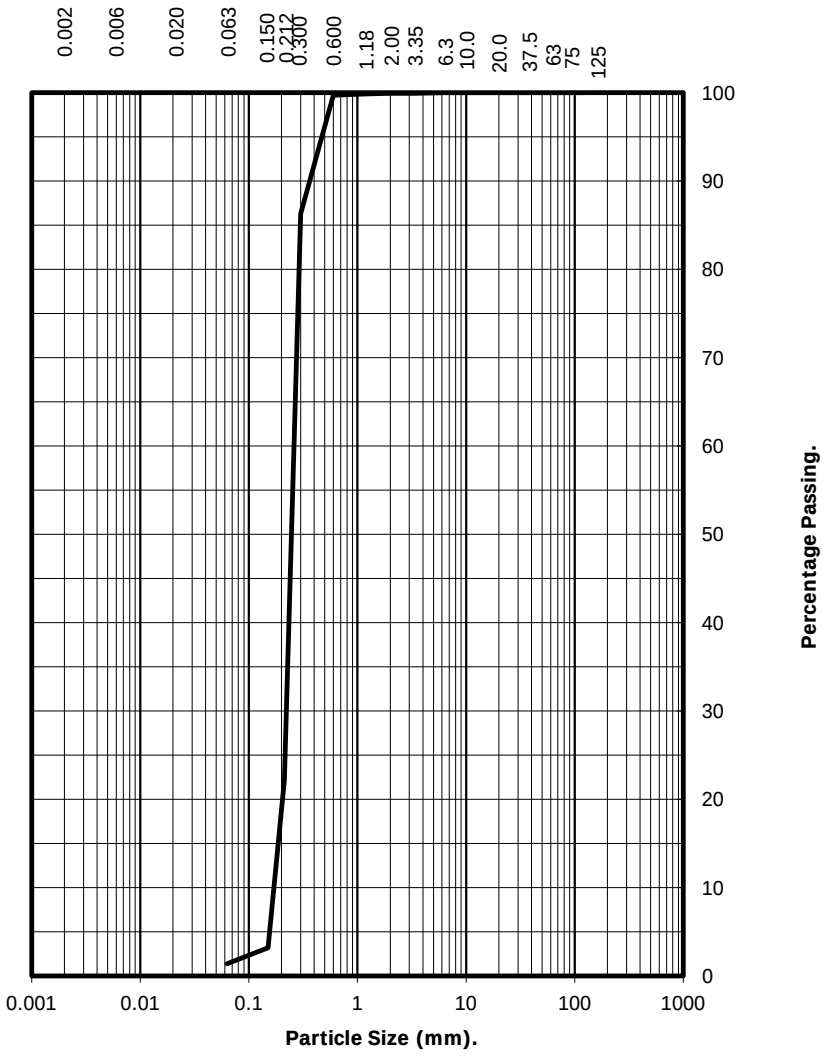
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**WS141**
Sample Number:	**7**
Depth from (m):	**3.50**
Depth to (m):	**4.00**
Sample Type:	**B**
Description:	**Brown silty SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	86
0.212	22
0.150	3
0.063	1

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	1	**99**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 13.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

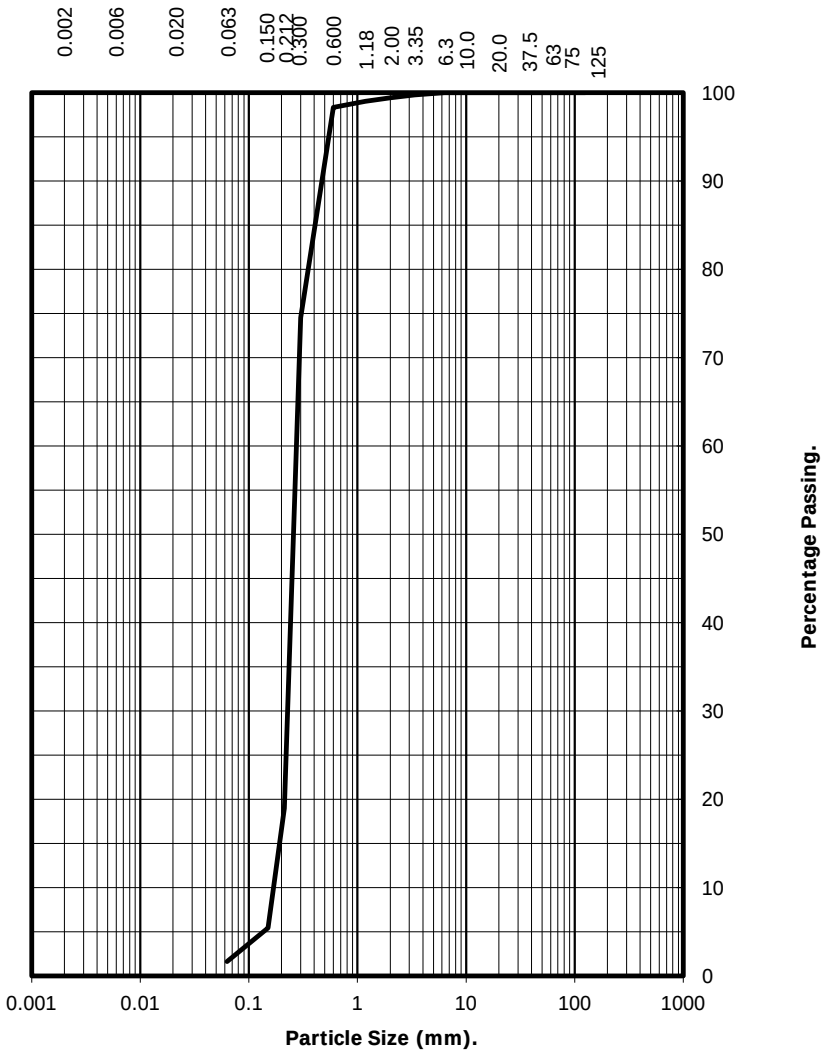
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**WS144**
Sample Number:	**8**
Depth from (m):	**3.50**
Depth to (m):	**4.00**
Sample Type:	**B**
Description:	**Brown gravelly (fine) silty clayey SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	99
1.18	99
0.60	98
0.300	75
0.212	19
0.150	5
0.063	2

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	2	**97**	**1**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 13.3.15

GSTL GEO SITE & TESTING SERVICES LTD

UKAS TESTING 2788

Test Report: **Particle Size Distribution Test**

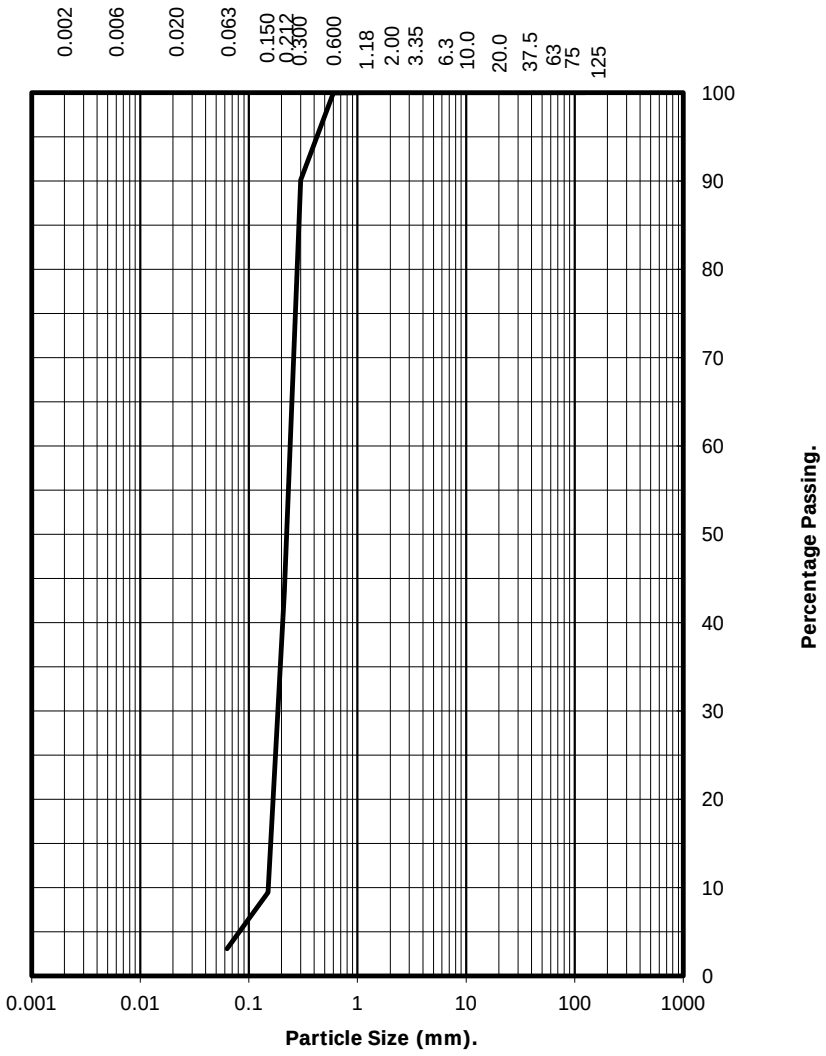
BS 1377 Part 2:1990.

Wet Sieve, Clause 9.2

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number:	**WS146**
Sample Number:	**7**
Depth from (m):	**4.00**
Depth to (m):	**5.00**
Sample Type:	**B**
Description:	**Brown silty clayey SAND**

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	100
0.300	90
0.212	43
0.150	9
0.063	3

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	3	**97**	**0**	**0**	Total Percentage

Remarks:

#- not determined

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

Date: 13.3.15

GSTL GEO SITE & TESTING SERVICES LTD

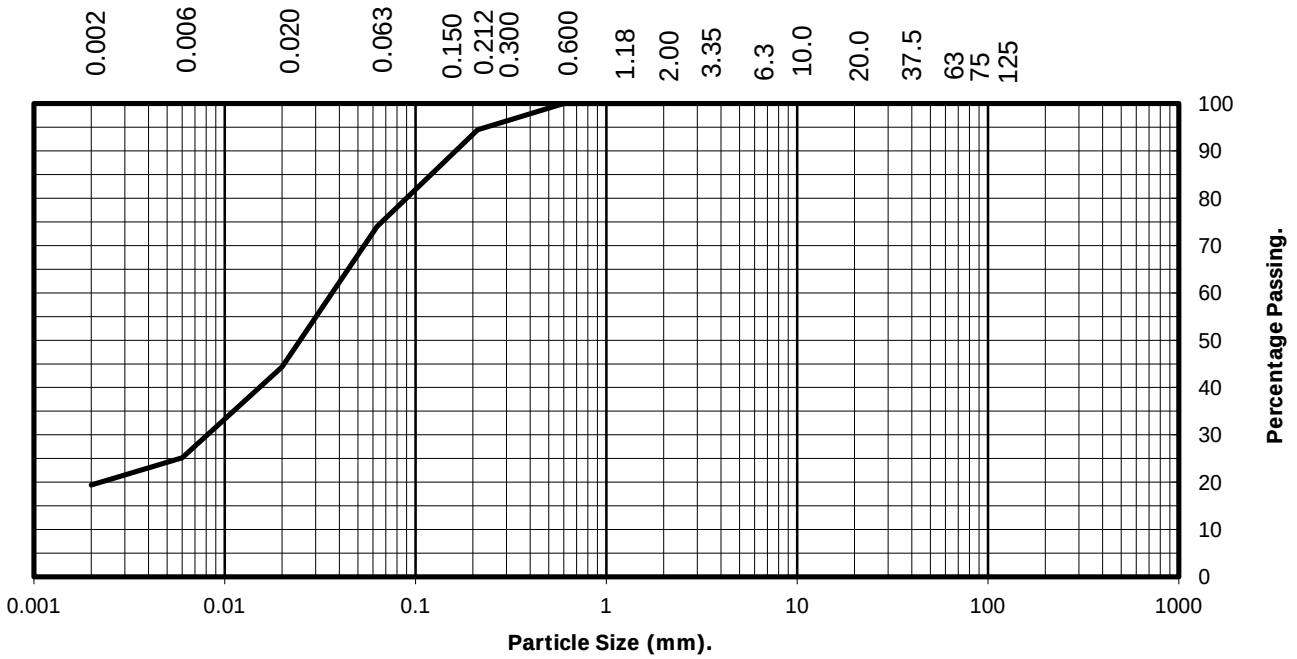
UKAS TESTING 2788

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH101**
Sample Number:	**26**
Depth from (m) :	**17.00**
Depth to (m) :	**17.45**
Description :	**Grey clayey sandy SILT**
Sample Type	**UT**



BS Test Sieve	Percentage Passing
2.00	100
0.60	100
0.212	94
0.063	74

Particle Diameter	Percentage Passing
0.02	44
0.006	25
0.002	19

Soil Fraction	Total Percentage
Gravel	0
Sand	26
Silt	55
Clay	19

Remarks:

Cl 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

GSTL
GEO SITE & TESTING SERVICES LTD

Date: 9.3.15

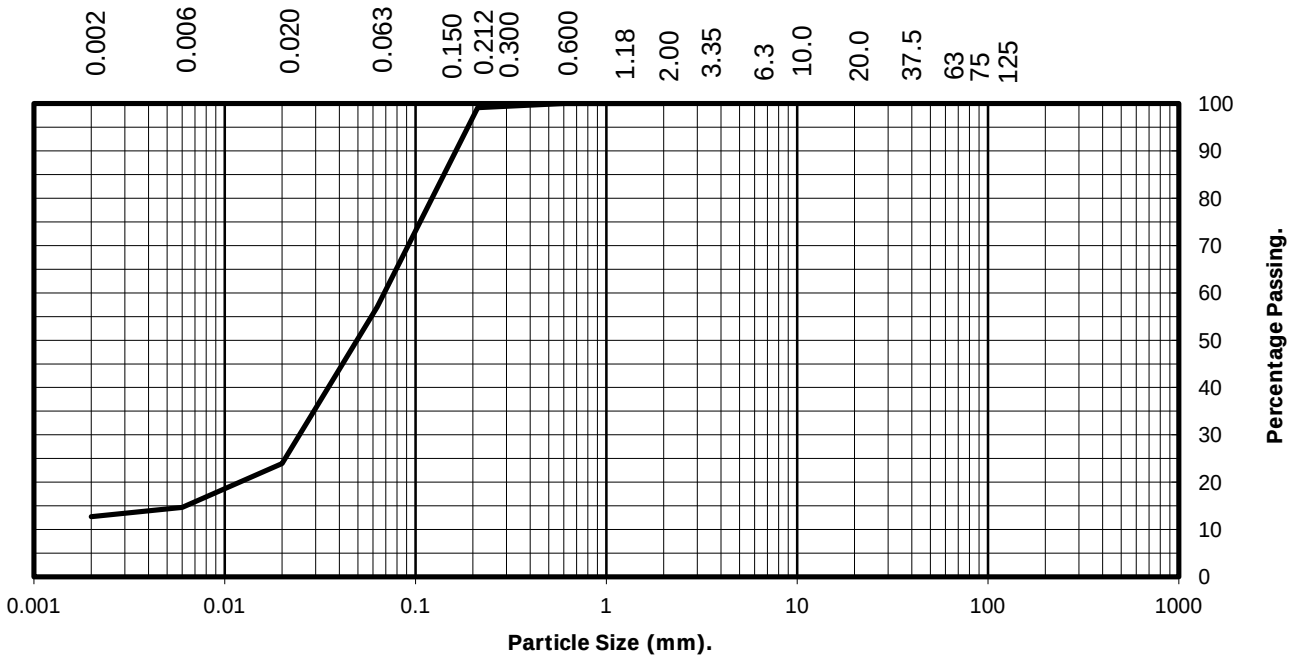
UKAS TESTING 2788

Particle Size Distribution Test

BS 1377 Part 2:1990.

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH103**
Sample Number:	**36**
Depth from (m) :	**18.50**
Depth to (m) :	**18.95**
Description :	**Grey clayey sandy SILT**
Sample Type	**UT**



BS Test Sieve	Percentage Passing
2.00	100
0.60	100
0.212	99
0.063	57

Particle Diameter	Percentage Passing
0.02	24
0.006	15
0.002	13

Soil Fraction	Total Percentage
Gravel	0
Sand	43
Silt	44
Clay	13

Remarks:

Cl 9.4.8 - Sample has not been pretreated

For and behalf of GEO Site & Testing Services Ltd

Authorised By: **Jonathan Tatam (Admin/Quality Assistant)**

GSTL
GEO SITE & TESTING SERVICES LTD

Date: 9.3.15

UKAS TESTING 2788

Unit 4
Heol Aur
Dafen Ind EstateDafen
Carmarthenshire
SA14 8QN
Tel: 01554 784040
01554 750752
Fax: 01554 770529
01554 784041
Web: www.geo.uk.com

Certificate of Analysis

Date:	06/03/2015
Client:	Hyder Consulting (UK) Ltd
Our Reference:	25981-020315
Client Reference:	UA007442-04
Contract Title:	Afon Lido
Description: (Total Samples)	19
Date Received:	02/03/2015
Date Started:	04/03/2015
Date Completed:	06/03/2015
Test Procedures:	(B.S. 1377 : PART 3 : 1990 AND BRE CP2/79)
Notes:	

Solid samples will be disposed 1 month and liquids 2 weeks after the date of issue of this test certificate

Approved By:

Authorised Signatories:

Emma Williams	Dafydd Simon	Paul Evans
Laboratory Office Manager	Laboratory Team Leader	Quality Manager

Contract No: 25981-020315
Client Ref: UA007442-04
Location: Afon Lido
Date: 06/03/2015

Summary of Chemical Analysis

(B.S. 1377 : PART 3 : 1990 AND BRE CP2/79)

Hole Number	Sample Type/ Number	Depth m	Sulphate Content SO3 (as SO_4)			Chloride Content		pH Value @ 25°C	Total Sulphur %	Magnesium g/l	Nitrate mg/l	loi %
			Acid Soluble Sulphate as % SO_4 Clause 5.5.	Aqueous Extract Sulphate as g/l SO_4 Clause 5.5.	Ground-water g/l Clause 5.4.	Soluble Chloride as % equiv. NaCl Clause 7.3	Ground-water g/l Clause 7.2	Clause 9.				
BH101	B1	1.00 - 1.20		0.08 (0.10)		<0.01		6.73	0.11			1.90
BH101	B5	2.90 - 3.20										0.40
BH102	B1	0.90	0.05 (0.06)	0.08 (0.09)		<0.01		6.70	0.09	<1	<10	
BH103	B4	0.00 - 1.00	0.07 (0.08)	0.13 (0.16)		<0.01		7.87	0.10	<1	<10	
BH103	B16	5.50 - 6.50	0.05 (0.06)	0.01 (0.02)		<0.01		8.06	0.08	<1	<10	
TP123	B1	0.00 - 0.10		0.01 (0.02)		<0.01		8.16	0.06			
TP124	B1	0.10 - 0.40		0.01 (0.01)		<0.01		7.68	0.05			
TP124	B6	1.50										0.60
TP125	B6	0.60		<.01 (0.01)				8.05				
TP126	B1	0.05		0.02 (0.02)				7.98				
TP127	B4	0.50		<.01 (0.01)				7.73				
TP127	B6	0.90		0.02 (0.02)				8.29				
TP134	B3	0.40		0.03 (0.04)		<0.01		10.16	0.07			
TP134	B5	0.90		0.02 (0.02)		<0.01		9.68	0.05			
WS141	B5	1.50 - 1.90				<0.01			0.07			0.30
WS143	B6	1.40 - 2.00		<.01 (<.01)		<0.01		8.90	0.08			
WS144	B6	1.00 - 1.50										0.40
WS145	B6	3.50 - 4.00		0.01 (0.01)		<0.01		8.69	0.06			
WS146	B6	2.50 - 3.00		0.01 (0.01)		<0.01		8.51	0.07			

NCP - No Chloride present

Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**

Location: **Afon Lido**

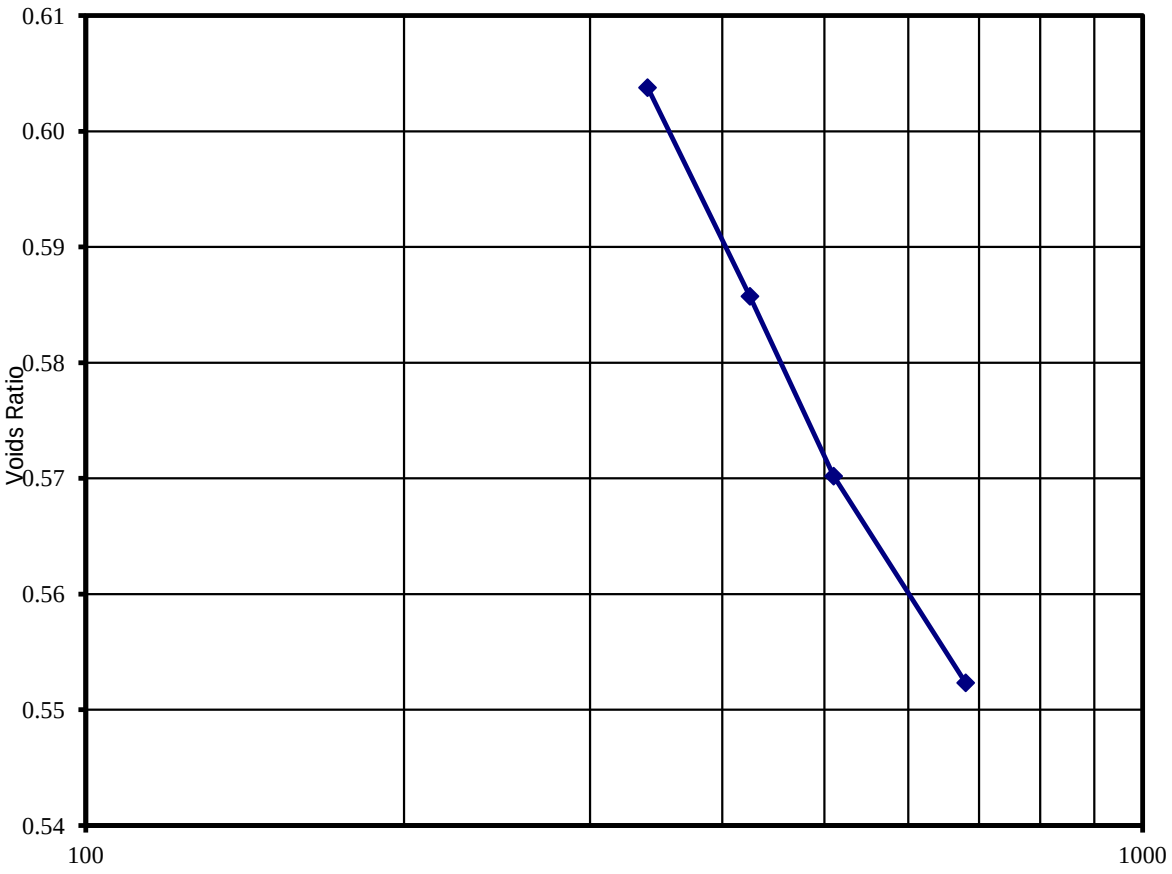
Contract Number: **25981-020315**

Hole/Sample Number: **BH101**

Depth (m) : **17.00 - 17.45**

Sample Type: **UT**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Method of time fitting used Cv Calculated using t90
Moisture Content (%):	27						
Bulk Density (Mg/m3):	1.94	0	-	340	0.21	6.6	Nominal Laboratory Temperature 20'C
Dry Density (Mg/m3):	1.53	340	-	425	0.13	2.4	
Voids Ratio:	0.7291	425	-	510	0.12	2.4	Location of specimen with sample top
Degree of saturation:	97.8	510	-	680	0.067	3.8	
Height (mm):	20.13						Remarks:
Diameter (mm)	50.01						
Particle Density (Mg/m3) Assumed	2.65						



GSTL
GEO SITE & TESTING SERVICES LTD

Checked by
Ben Sharp (Contracts Manager

Approved by
Paul Evans (Quailty Manager)

Date approved: 13/03/15

UKAS TESTING 2788

Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**

Location: **Afon Lido**

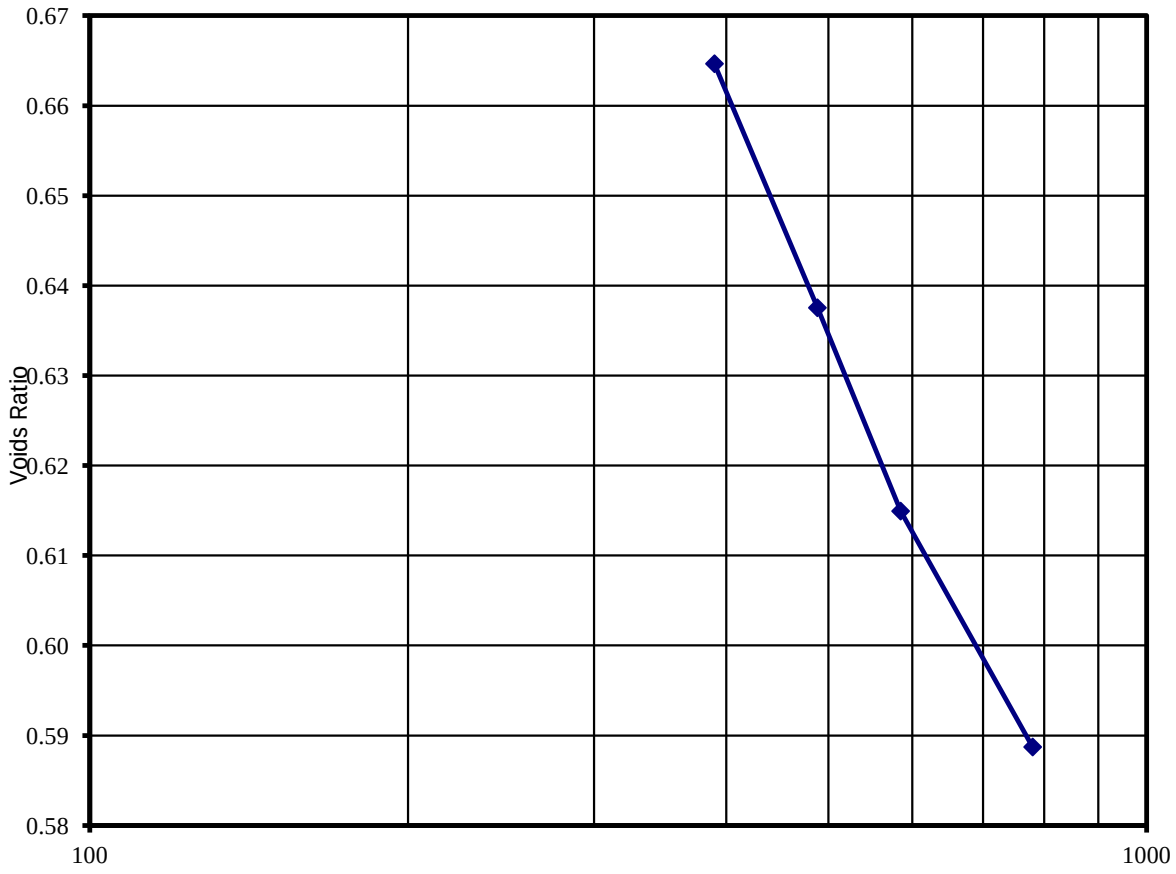
Contract Number: **25981-020315**

Hole/Sample Number: **BH101**

Depth (m) : **19.50 - 19.95**

Sample Type: **UT**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Method of time fitting used Cv Calculated using t90
Moisture Content (%):	31						
Bulk Density (Mg/m3):	1.91	0	-	390	0.21	4.6	Nominal Laboratory Temperature 20'C
Dry Density (Mg/m3):	1.46	390	-	488	0.17	0.58	
Voids Ratio:	0.8118	488	-	585	0.14	1.5	Location of specimen with sample top
Degree of saturation:	100.9	585	-	780	0.083	2.8	
Height (mm):	20.04						Remarks:
Diameter (mm)	50.02						
Particle Density (Mg/m3) Assumed	2.65						



GSTL
GEO SITE & TESTING SERVICES LTD

Checked by
Ben Sharp (Contracts Manager

Approved by
Paul Evans (Quailty Manager)

Date approved: 13/03/15

UKAS TESTING 2788

Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**

Location: **Afon Lido**

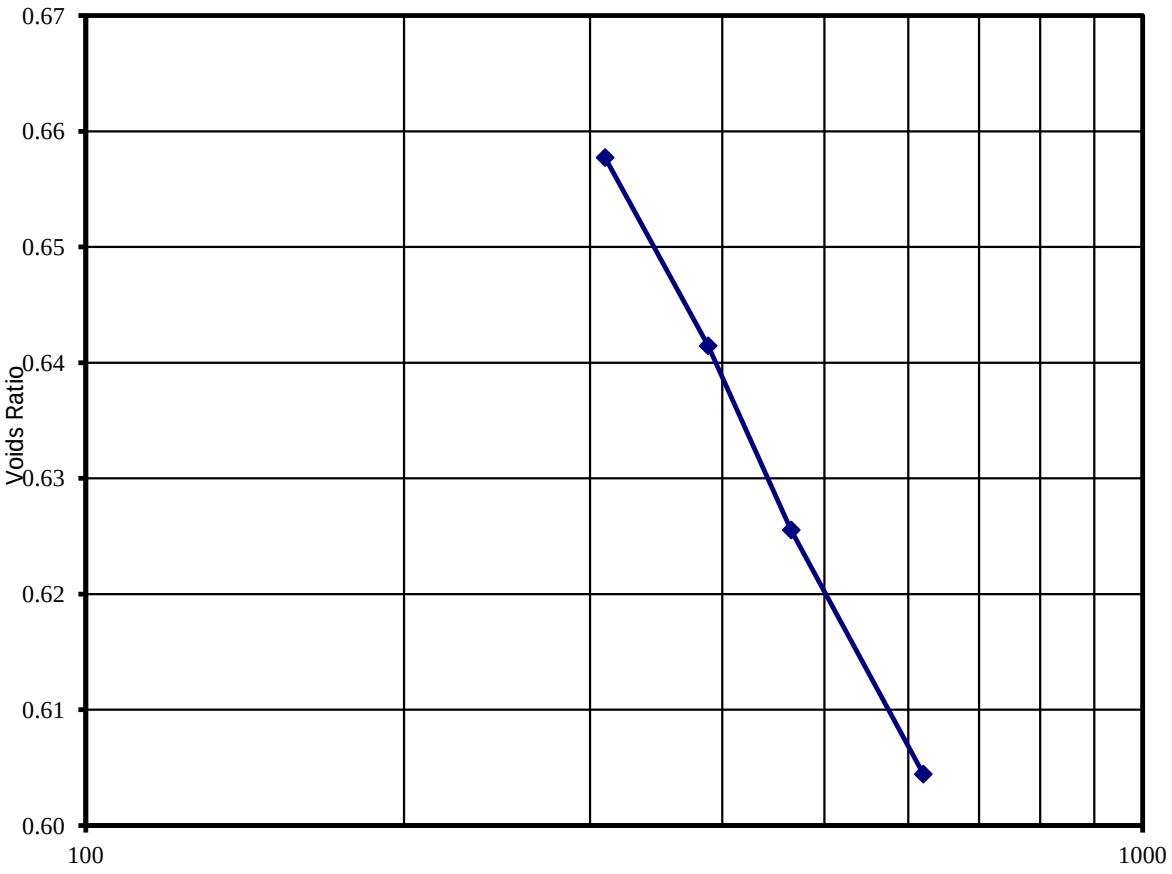
Contract Number: **25981-020315**

Hole/Sample Number: **BH102**

Depth (m) : **15.50 - N/A**

Sample Type: **UT**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Method of time fitting used Cv Calculated using t90
Moisture Content (%):	29						
Bulk Density (Mg/m3):	1.90	0	-	310	0.24	9.1	Nominal Laboratory Temperature
Dry Density (Mg/m3):	1.48	310	-	388	0.13	1.5	20'C
Voids Ratio:	0.7904	388	-	465	0.13	1.6	Location of specimen with sample
Degree of saturation:	96.0	465	-	620	0.084	5.1	top
Height (mm):	20.02						Remarks:
Diameter (mm)	50.05						
Particle Density (Mg/m3) Assumed	2.65						



GSTL
GEO SITE & TESTING SERVICES LTD

Checked by
Ben Sharp (Contracts Manager

Approved by
Paul Evans (Quailty Manager)

Date approved: 13/03/15

UKAS TESTING 2788

Test Report: ONE DIMENSIONAL CONSOLIDATION

BS1377: Part 5: 1990

Client ref: **UA007442-04**

Location: **Afon Lido**

Contract Number: **25981-020315**

Hole/Sample Number: **BH103**

Depth (m) : **18.50 - 18.95**

Sample Type: **UT**

Initial Conditions		Pressure Range kPa			Mv m2/MN	Cv m2/yr	Method of time fitting used Cv Calculated using t90
Moisture Content (%):	30						
Bulk Density (Mg/m3):	1.96	0	-	370	0.28	17	Nominal Laboratory Temperature 20'C
Dry Density (Mg/m3):	1.50	370	-	463	0.13	0.81	
Voids Ratio:	0.7635	463	-	555	0.051	1.1	Location of specimen with sample top
Degree of saturation:	104.5	555	-	740	0.068	1.8	
Height (mm):	20.03						Remarks:
Diameter (mm)	50						
Particle Density (Mg/m3) Assumed	2.65						



GSTL
GEO SITE & TESTING SERVICES LTD

Checked by
Ben Sharp (Contracts Manager

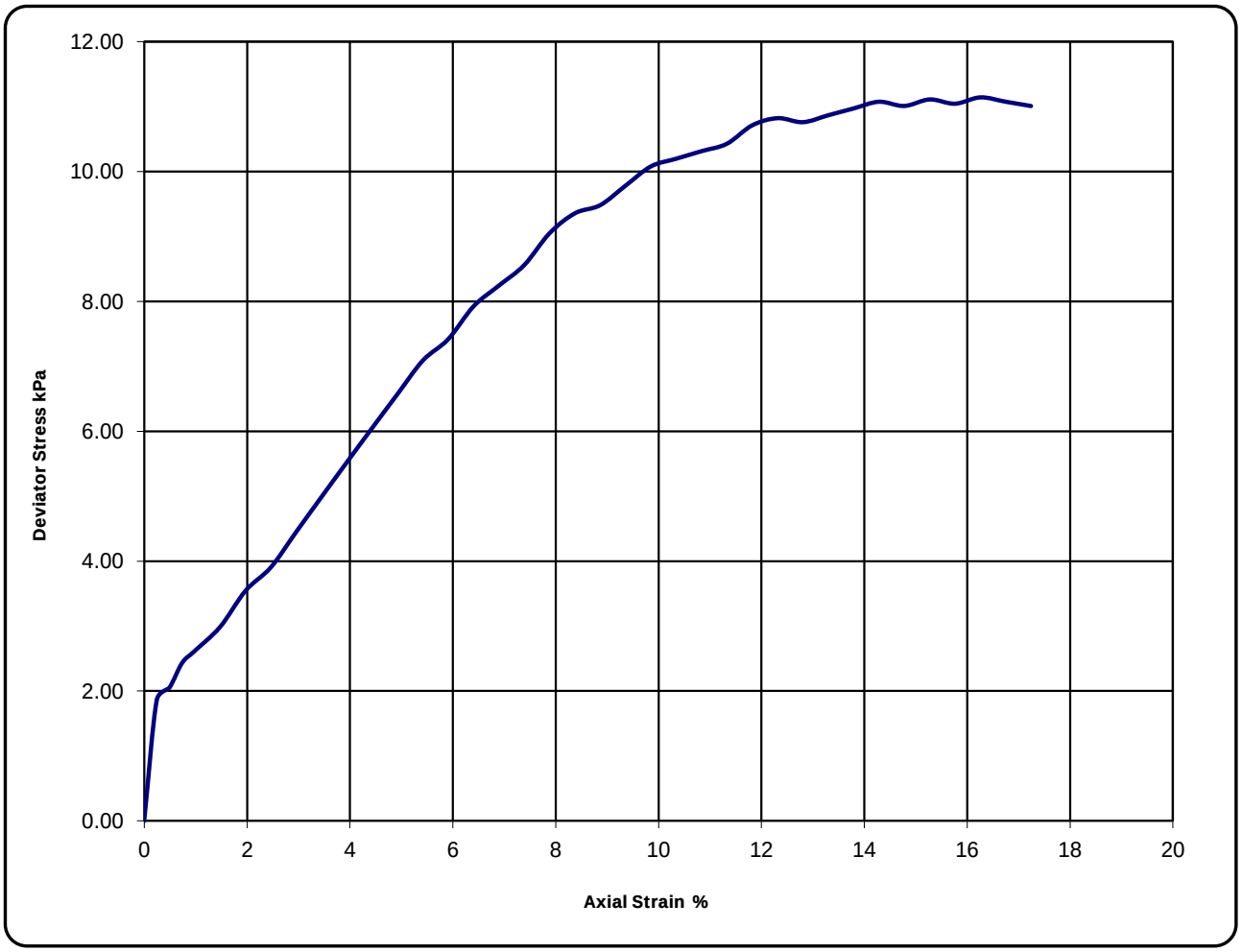
Approved by
Paul Evans (Quailty Manager)

Date approved: 16/03/15

UKAS TESTING 2788

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH101**
Sample Number:	**26**
Depth (m) :	**17.00 to 17.45**
Sample Type :	**UT**
Sample Description :	**Soft to firm greyish brown sandy fine to medium silty CLAY.**



Diameter (mm):		104	Height (mm):		203	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	25.1	2.05	1.64	340	11	6	16.3	Compound	Latex Membrane used 0.2 mm thickness

GEO Site & Testing Services Limited

Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

UKAS TESTING 2788

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH101**
Sample Number:	**N/A**
Depth (m) :	**17.00**
Sample Type :	**UT**



Post Test Specimen



Specimen Split

Diameter (mm):		104	Height (mm):		203	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	25.1	2.05	1.64	340	11	6	16.3	Compound	Latex Membrane used 0.2 mm thickness

GSTL
GEO Site & Testing Services Limited

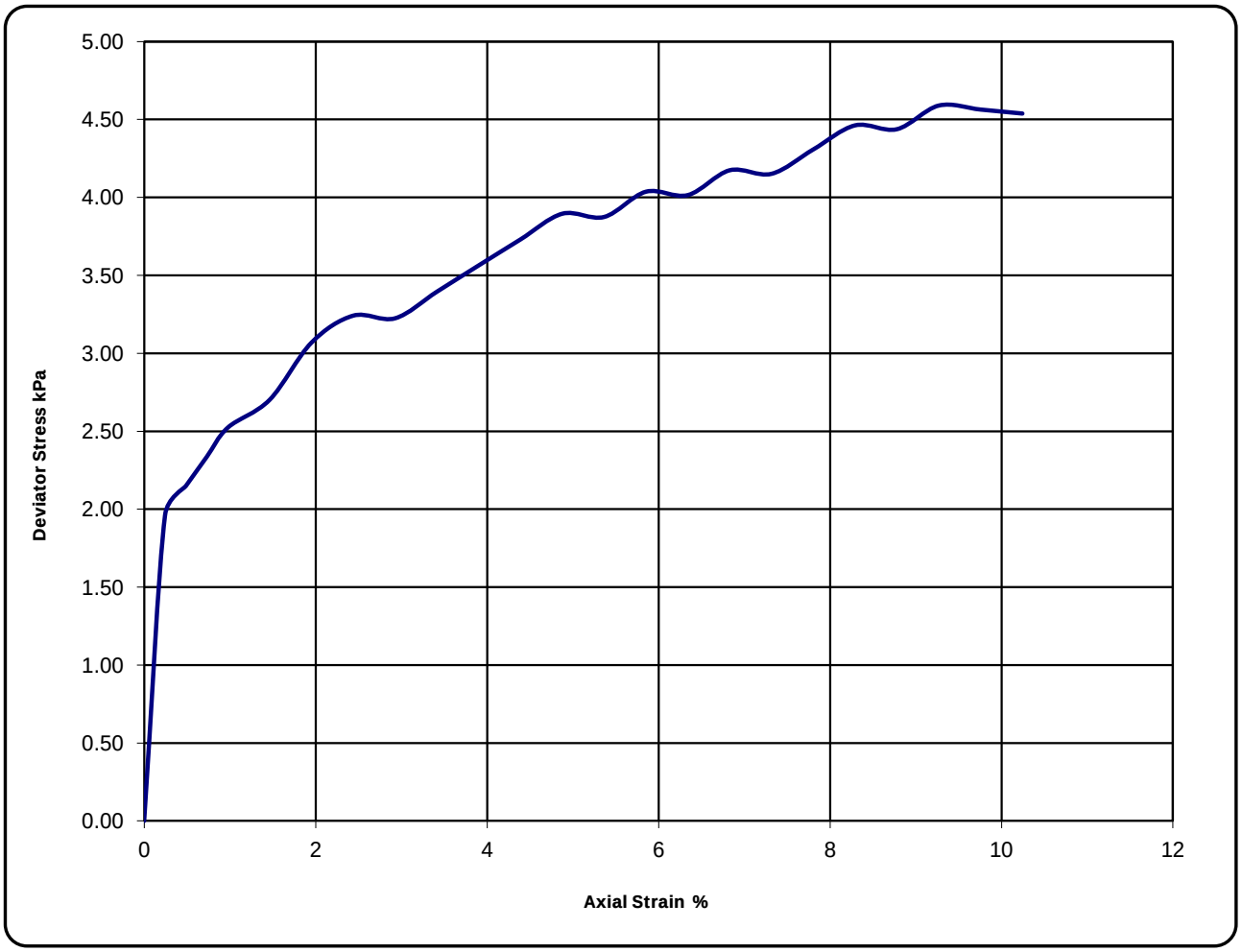
UKAS TESTING 2788

Checked Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH101**
Sample Number:	**31**
Depth (m) :	**19.50 to 19.95**
Sample Type :	**UT**
Sample Description :	**Soft to firm greyish brown silty CLAY.**



Diameter (mm):		104	Height (mm):		205	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	31.6	1.95	1.48	390	5	2	9.3	Plastic	Latex Membrane used 0.2 mm thickness

GEO Site & Testing Services Limited

Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

UKAS TESTING 2788

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH101**
Sample Number:	**N/A**
Depth (m) :	**19.50**
Sample Type :	**UT**



Post Test Specimen



Specimen Split

Diameter (mm):		104	Height (mm):		205	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	31.6	1.95	1.48	390	5	2	9.3	Plastic	Latex Membrane used 0.2 mm thickness

GSTL
GEO Site & Testing Services Limited

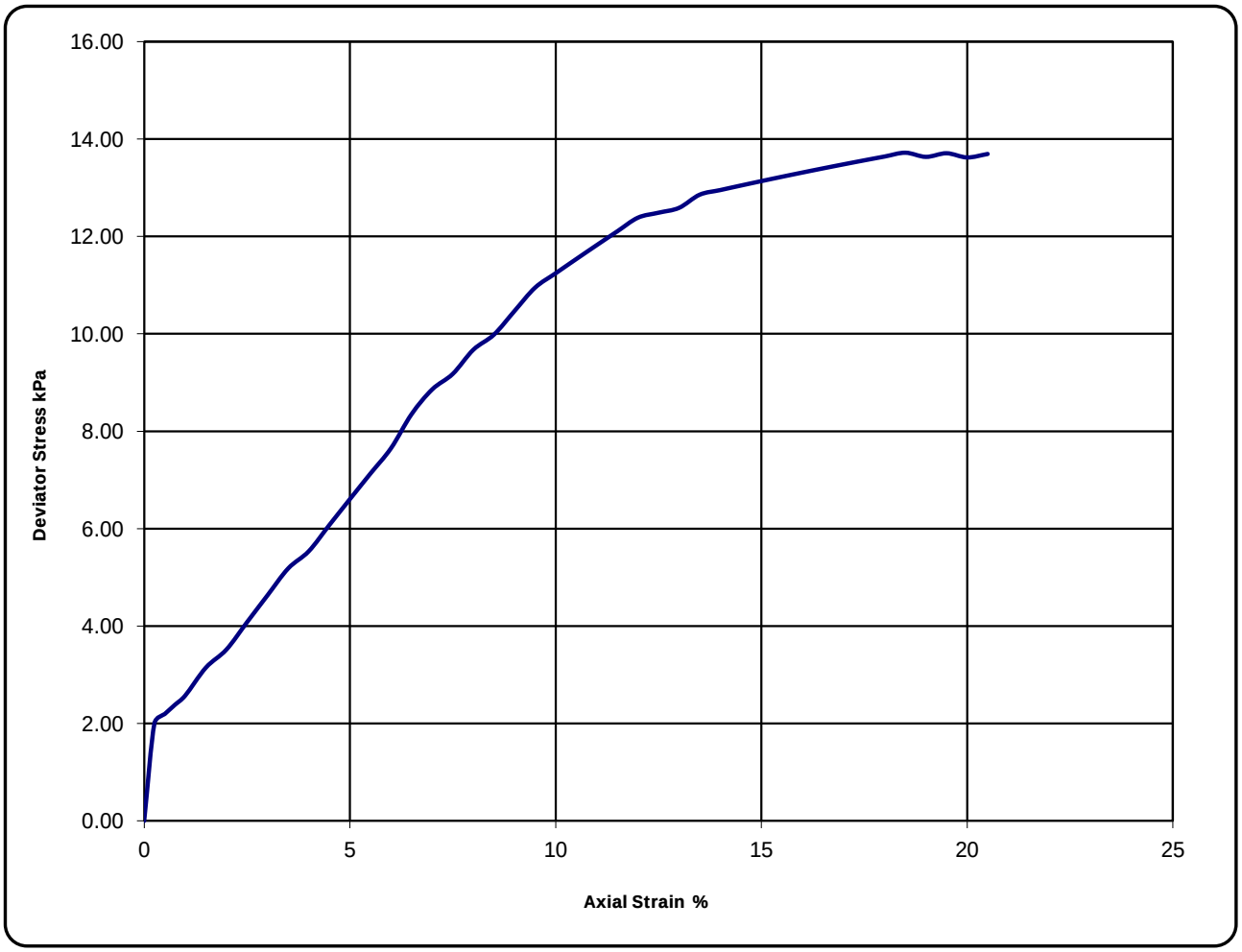
UKAS TESTING 2788

Checked Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH102**
Sample Number:	**24**
Depth (m) :	**15.50 to 15.95**
Sample Type :	**UT**
Sample Description :	**Soft to firm greyish brown sandy (fine to medium) silty CLAY.**



Diameter (mm):		103	Height (mm):		200	Test:	UT 103 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	25.2	2.10	1.68	310	14	7	18.5	Compound	Latex Membrane used 0.2 mm thickness

GEO Site & Testing Services Limited

Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

UKAS TESTING 2788

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH102**
Sample Number:	**N/A**
Depth (m) :	**15.50**
Sample Type :	**UT**



Post Test Specimen



Specimen Split

Diameter (mm):		103	Height (mm):		200	Test:	UT 103 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	25.2	2.10	1.68	310	14	7	18.5	Compound	Latex Membrane used 0.2 mm thickness

GSTL
GEO Site & Testing Services Limited

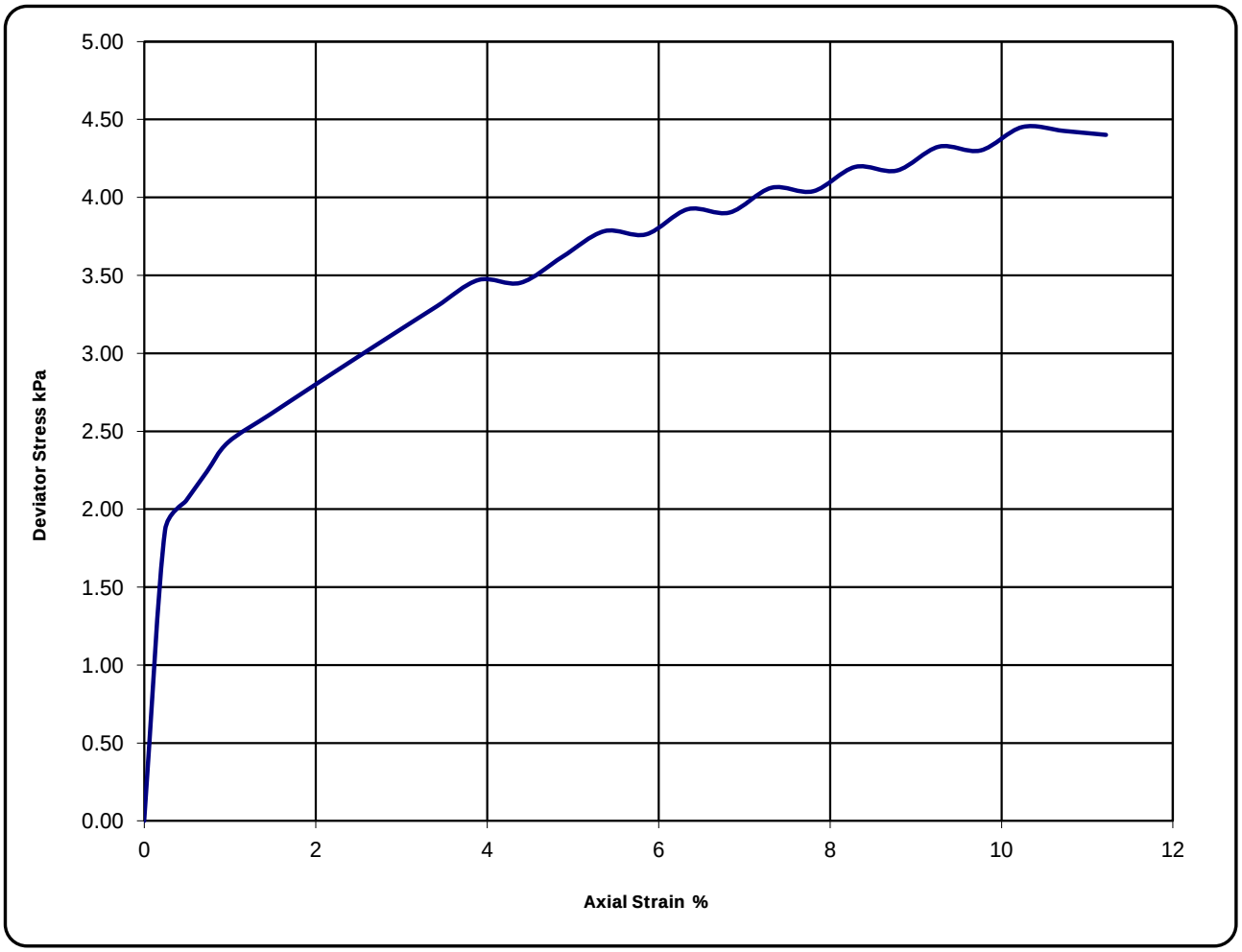
UKAS TESTING 2788

Checked Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH103**
Sample Number:	**36**
Depth (m) :	**18.50 to 18.95**
Sample Type :	**UT**
Sample Description :	**Soft to firm greyish brown silty CLAY.**



Diameter (mm):		104	Height (mm):		205	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	27.5	2.04	1.60	370	4	2	10.2	Plastic	Latex Membrane used 0.2 mm thickness

GEO Site & Testing Services Limited

Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

UKAS TESTING 2788

Test Report: **Undrained Shear Strength in Triaxial Compression**
BS 1377 : Part7 : Clause 8 : 1990 Single Stage Test
without measurement of Pore Pressure

Client ref:	**UA007442-04**
Location:	**Afon Lido**
Contract Number:	**25981-020315**
Hole Number	**BH103**
Sample Number:	**N/A**
Depth (m) :	**18.50**
Sample Type :	**UT**



Post Test Specimen



Specimen Split

Diameter (mm):		104	Height (mm):		205	Test:	UT 104 mm Single Stage.		
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Deviator Stress (kPa)	Cohesion (kPa)	Failure Strain (%)	Mode of Failure	Remarks Sample taken from Top of tube Rate of strain = 2 %/min
A	27.5	2.04	1.60	370	4	2	10.2	Plastic	Latex Membrane used 0.2 mm thickness

GSTL
GEO Site & Testing Services Limited

UKAS TESTING 2788

Checked Checked By
Ben Sharp (Contracts Manager)
Date Approved: 13.3.15

Approved By:
Paul Evans (Quality Manager)

Appendix E

Chemical Laboratory Analysis Results

Laura Cohu
Hyder Consulting (UK) Ltd
5th Floor
The Pithay
Bristol
BS1 2NL

t: 01173721360

e: laura.cohu@hyderconsulting.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 15-72366

Project / Site name:	Afan Lido	**Samples received on:**	26/05/2015
Your job number:		**Samples instructed on:**	27/05/2015
Your order number:		**Analysis completed by:**	03/06/2015
Report Issue Number:	1	**Report issued on:**	03/06/2015
Samples Analysed:	2 water samples		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-72366

Project / Site name: Afan Lido

Lab Sample Number				447775	447776			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/05/2015	22/05/2015			
Time Taken				1030	1100			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.4	7.3			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO_4	µg/l	45	ISO 17025	189000	32700			
Chloride	mg/l	0.15	ISO 17025	41	44			
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	ISO 17025	< 0.20	< 0.20			

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-72366

Project / Site name: Afan Lido

Lab Sample Number				447775	447776			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				22/05/2015	22/05/2015			
Time Taken				1030	1100			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.47	0.87			
Boron (dissolved)	µg/l	10	ISO 17025	63	41			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.06	< 0.02			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	2.8	2.8			
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3	0.4			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	4.0	3.7			
Selenium (dissolved)	µg/l	0.6	ISO 17025	11	4.0			
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.3	1.8			
Monoaromatics								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C5 - C7	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C7 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

U/S = Unsuitable Sample I/S = Insufficient Sample

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 15-72366

Project / Site name: Afan Lido

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in water	Determination of boron by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073W-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082 B	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH in water	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L070-UK	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-UK	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Laura Cohu
Hyder Consulting (UK) Ltd
5th Floor
The Pithay
Bristol
BS1 2NL

t: 01173721360

e: laura.cohu@hyderconsulting.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 15-69059

Project / Site name:	Afon Lido	**Samples received on:**	26/03/2015
Your job number:		**Samples instructed on:**	26/03/2015
Your order number:		**Analysis completed by:**	08/04/2015
Report Issue Number:	1	**Report issued on:**	08/04/2015
Samples Analysed:	2 water samples		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-69059

Project / Site name: Afon Lido

Lab Sample Number				429599	429600			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				25/03/2015	25/03/2015			
Time Taken				1204	1215			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
General Inorganics								
pH	pH Units	N/A	ISO 17025	7.5	7.6			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO_4	µg/l	45	ISO 17025	67000	70100			
Chloride	mg/l	0.15	ISO 17025	50	50			
Total Phenols								
Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
Speciated PAHs								
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Total PAH								
Total EPA-16 PAHs	µg/l	0.2	ISO 17025	< 0.20	< 0.20			
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.24	1.94			
Boron (dissolved)	µg/l	10	ISO 17025	270	140			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.4			
Copper (dissolved)	µg/l	0.5	ISO 17025	6.4	9.1			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.9	3.3			
Zinc (dissolved)	µg/l	0.5	ISO 17025	7.6	2.0			

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-69059

Project / Site name: Afon Lido

Lab Sample Number				429599	429600			
Sample Reference				BH102	BH103			
Sample Number				None Supplied	None Supplied			
Depth (m)				None Supplied	None Supplied			
Date Sampled				25/03/2015	25/03/2015			
Time Taken				1204	1215			
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C5 - C7	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C7 - C8	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C8 - C10	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10			

U/S = Unsuitable Sample I/S = Insufficient Sample

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 15-69059

Project / Site name: Afon Lido

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Boron in water	Determination of boron by acidification followed by ICP-MS. Accredited matrices: SW, GW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Chloride in water	Determination of Chloride in water by Gallery Discrete Analyser based on reaction with mercury (II) thiocyanate and acid solution with iron (III) nitrate to form a red/brown iron (III) thiocyanate complex; followed by spectrophotometrice measurementat a wavelenght of 480 nm.	Methods for the Examination of Water and Associated Materials Chloride in Waters, Sewage and Effluents 1981.ISBN 0117516260 Accredited matrices: SW, PW, GW.	L082 B	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Monohydric phenols in water	Determination of phenols in water by continuous flow analyser. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
pH in water	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L070-UK	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-UK	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Ian Parsons
Hyder Consulting (UK) Ltd
HCL House
St Mellon's Business Park
Cardiff
CF3 OEY

t: 029 2092 6873

e: ian.parsons@hyderconsulting.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Preliminary Report Number : 15-67903

Project / Site name:	Afan Lido, Port Talbot	**Samples received on:**	25/02/2015
Your job number:	UA007442	**Samples instructed on:**	02/03/2015
Your order number:		**Analysis completed by:**	11/03/2015
Report Issue Number:	0	**Report issued on:**	11/03/2015
Samples Analysed:	33 soil samples		

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.
Preliminary reports provided at the request of the client should be considered as incomplete and have not been through the complete quality control procedure.

Results contained in preliminary reports may be subject to change and therefore should not be used as a basis for decision making, except at the risk of the client.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422328	422329	422330	422331	422332
Sample Reference				BH101	BH101	TP123	TP123	TP124
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	0.50	1.00	0.50
Date Sampled				16/02/2015	16/02/2015	17/02/2015	17/02/2015	17/02/2015
Time Taken				0830	1130	0830	0830	0915
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.2	13	3.8	3.4	4.2
Total mass of sample received	kg	0.001	NONE	1.5	1.3	1.3	1.4	1.4
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.0	8.0	8.1	8.1	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	2	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.11	0.096	0.0069	0.0035	0.0078
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	110	96	6.9	3.5	7.8
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.057	0.048	0.0035	0.0018	0.0039
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-	-	0.92
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-	-	To follow
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.20	0.74	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	0.23	1.7	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	0.76	0.87	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	0.45	2.7	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	14	8.2	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	3.4	3.4	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	25	11	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	18	8.2	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	12	3.8	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	11	3.4	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	9.7	3.3	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	5.9	1.8	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	8.1	2.9	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	4.5	1.8	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	1.3	0.33	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	4.6	2.2	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	120	56.2	< 1.60	< 1.60	< 1.60

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422328	422329	422330	422331	422332
Sample Reference				BH101	BH101	TP123	TP123	TP124
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	1.00	0.50	1.00	0.50
Date Sampled				16/02/2015	16/02/2015	17/02/2015	17/02/2015	17/02/2015
Time Taken				0830	1130	0830	0830	0915
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21	20	53	14	19
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4	1.6	0.3	0.3	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	25	11	3.2	5.8	2.9
Copper (aqua regia extractable)	mg/kg	1	MCERTS	280	87	40	11	33
Lead (aqua regia extractable)	mg/kg	1	MCERTS	350	310	12	10	16
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	18	6.1	6.0	7.6
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	390	280	53	35	78
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	22	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	84	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	290	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	400	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	2.9	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	32	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	120	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	190	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	340	-	-	-

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422333	422334	422335	422336	422337
Sample Reference				WS142	WS148	WS147	TP133	TP133
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.60	0.50-0.60	0.20-0.30	0.20	0.40
Date Sampled				17/02/2015	17/02/2015	17/02/2015	18/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	0930	0930
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	13	20	5.7	13	15
Total mass of sample received	kg	0.001	NONE	1.3	1.0	1.4	1.3	1.1
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Crocidolite- Loose fibres
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.2	8.0	8.1	8.2	8.1
Total Cyanide	mg/kg	1	MCERTS	< 1	5	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.12	0.18	1.1	0.33	0.28
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	120	180	1100	330	280
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.062	0.091	0.56	0.16	0.14
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.28	0.31	< 0.05	< 0.05	0.41
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	0.90	1.0	0.24	< 0.10	0.93
Anthracene	mg/kg	0.1	MCERTS	< 0.10	0.12	< 0.10	< 0.10	0.14
Fluoranthene	mg/kg	0.1	MCERTS	1.3	1.1	0.22	< 0.10	2.0
Pyrene	mg/kg	0.1	MCERTS	1.1	0.87	0.24	< 0.10	1.8
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.82	0.93	< 0.10	< 0.10	1.5
Chrysene	mg/kg	0.05	MCERTS	1.1	1.1	< 0.05	< 0.05	1.5
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.96	1.0	< 0.10	< 0.10	1.8
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.60	0.58	< 0.10	< 0.10	0.94
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.73	0.64	< 0.10	< 0.10	1.5
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.52	0.51	< 0.10	< 0.10	1.0
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	0.27
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.54	0.65	< 0.05	< 0.05	1.2
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	8.79	8.91	< 1.60	< 1.60	15.0

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422333	422334	422335	422336	422337
Sample Reference				WS142	WS148	WS147	TP133	TP133
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50-0.60	0.50-0.60	0.20-0.30	0.20	0.40
Date Sampled				17/02/2015	17/02/2015	17/02/2015	18/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	0930	0930
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	380	210	600	1100	40
Boron (water soluble)	mg/kg	0.2	MCERTS	1.8	0.7	1.3	0.4	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	3.4	4.1	27	64	5.6
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	39	41	19	27	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	3900	360	1300	1300	640
Lead (aqua regia extractable)	mg/kg	1	MCERTS	560	2500	23000	24000	280
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	95	85	78	100	81
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	2400	5200	40000	40000	1500
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422338	422339	422340	422341	422342
Sample Reference				TP127	TP128	WS144	TP125	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.25	0.35-0.50	0.20	1.00
Date Sampled				18/02/2015	18/02/2015	20/02/2015	17/02/2015	17/02/2015
Time Taken				1030	1130	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.3	5.5	4.0	9.1	12
Total mass of sample received	kg	0.001	NONE	1.5	1.4	1.4	1.3	1.5
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.2	8.0	8.8	8.6	8.8
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.017	2.4	0.014	0.87	0.020
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	17	2400	14	870	20
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.0085	1.2	0.0071	0.44	0.010
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-	3.3	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-	To follow	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.75	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.18	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.77	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.60	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.51	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.42	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.45	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.24	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.34	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	0.22	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.25	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	4.73	< 1.60

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422338	422339	422340	422341	422342
Sample Reference				TP127	TP128	WS144	TP125	TP125
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.25	0.35-0.50	0.20	1.00
Date Sampled				18/02/2015	18/02/2015	20/02/2015	17/02/2015	17/02/2015
Time Taken				1030	1130	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	110	16	19	16
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.4	0.3	0.9	0.2
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	1.9	5.5	1.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	5.9	8.2	2.6	35	2.7
Copper (aqua regia extractable)	mg/kg	1	MCERTS	8.0	230	21	89	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	11	1500	70	170	9.4
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.2	12	5.7	26	4.5
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	43	2300	910	280	38
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422343	422344	422345	422346	422347
Sample Reference				TP126	TP134	TP137	TP137	TP129
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.20	0.50	0.50
Date Sampled				17/02/2015	17/02/2015	17/02/2015	17/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	1245
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.5	6.1	10	17	4.7
Total mass of sample received	kg	0.001	NONE	1.5	1.2	1.3	1.3	1.5
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile- Loose fibres	Amosite- Loose fibres	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Detected	Detected	Not-detected	Not-detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.9	8.7	8.6	8.2	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.026	0.12	2.5	1.1	0.027
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	26	120	2500	1100	27
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.013	0.058	1.3	0.55	0.014
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	4.6	-	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	To follow	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422343	422344	422345	422346	422347
Sample Reference				TP126	TP134	TP137	TP137	TP129
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.20	0.50	0.50
Date Sampled				17/02/2015	17/02/2015	17/02/2015	17/02/2015	18/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	1245
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	23	8.3	22	45	13
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.8	2.6	2.5	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	2.0	0.6	0.6	2.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	7.5	34	16	36	6.2
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33	47	31	58	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	300	68	200	340	34
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	9.9	19	12	35	7.9
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	760	180	460	670	81
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422348	422349	422350	422351	422352
Sample Reference				TP132	TP132	WS141	WS141	WS145
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.40	0.30-0.50	1.20-1.40	0.15-0.25
Date Sampled				18/02/2015	18/02/2015	20/02/2015	20/02/2015	20/02/2015
Time Taken				1500	1500	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	16	2.7	3.9	8.6
Total mass of sample received	kg	0.001	NONE	1.3	1.1	1.3	1.4	1.2
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.5	8.5	8.5	8.6	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.45	0.27	0.16	0.023	0.11
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	450	270	160	23	110
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.23	0.13	0.079	0.011	0.054
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	0.85	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	To follow	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	0.35	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	0.17	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	0.23	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422348	422349	422350	422351	422352
Sample Reference				TP132	TP132	WS141	WS141	WS145
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.40	0.30-0.50	1.20-1.40	0.15-0.25
Date Sampled				18/02/2015	18/02/2015	20/02/2015	20/02/2015	20/02/2015
Time Taken				1500	1500	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	1200	130	21	13	52
Boron (water soluble)	mg/kg	0.2	MCERTS	0.7	1.0	0.3	0.3	0.5
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	63	12	0.8	< 0.2	0.9
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	28	25	5.1	4.5	30
Copper (aqua regia extractable)	mg/kg	1	MCERTS	1600	300	67	12	240
Lead (aqua regia extractable)	mg/kg	1	MCERTS	23000	2000	930	33	960
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	96	65	7.9	5.2	77
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	47000	4500	800	39	1000
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422353	422354	422355	422356	422357
Sample Reference				WS146	WS143	WS143	TP130	TP130
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.20-0.30	1.10-1.20	0.50	1.00
Date Sampled				20/02/2015	20/02/2015	20/02/2015	19/02/2015	19/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	5.5	3.6	1.4	2.4	3.2
Total mass of sample received	kg	0.001	NONE	1.3	1.2	1.4	1.3	1.3
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH	pH Units	N/A	MCERTS	8.6	8.2	8.6	8.4	8.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.14	1.6	0.019	0.036	0.018
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	140	1600	19	36	18
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.069	0.82	0.0095	0.018	0.0088
Loss on Ignition @ 450°C	%	0.2	MCERTS	6.0	-	-	-	-
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	To follow	-	-	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	0.51	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	0.85	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	0.68	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.46	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	0.63	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.77	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.43	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.48	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	4.81	< 1.60	< 1.60	< 1.60	< 1.60

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422353	422354	422355	422356	422357
Sample Reference				WS146	WS143	WS143	TP130	TP130
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.50	0.20-0.30	1.10-1.20	0.50	1.00
Date Sampled				20/02/2015	20/02/2015	20/02/2015	19/02/2015	19/02/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	24	11	11	16	17
Boron (water soluble)	mg/kg	0.2	MCERTS	0.8	1.7	0.3	0.3	0.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.3	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41	15	4.5	6.1	6.4
Copper (aqua regia extractable)	mg/kg	1	MCERTS	150	44	7.7	10	9.6
Lead (aqua regia extractable)	mg/kg	1	MCERTS	160	33	7.8	22	42
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	60	4.0	5.6	7.2	5.6
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	3.3	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	240	56	35	56	60
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-	-
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-	-
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-	-

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422358	422359	422360		
Sample Reference				TP135	TP136	TP136		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.00	0.25	0.75		
Date Sampled				19/02/2015	19/02/2015	19/02/2015		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	7.8	4.2	3.3		
Total mass of sample received	kg	0.001	NONE	1.3	1.4	1.3		
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		
General Inorganics								
pH	pH Units	N/A	MCERTS	8.3	10.7	9.4		
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Free Cyanide	mg/kg	1	NONE	< 1	< 1	< 1		
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.11	0.18	0.51		
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	110	180	510		
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.054	0.092	0.26		
Loss on Ignition @ 450°C	%	0.2	MCERTS	-	-	-		
Calorific Value (Subcontracted)	MJ/Kg	0.01	NONE	-	-	-		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	0.21	< 0.10		
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	0.32	< 0.10		
Pyrene	mg/kg	0.1	MCERTS	< 0.10	0.23	< 0.10		
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60		

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 15-67903

Project / Site name: Afan Lido, Port Talbot

Lab Sample Number				422358	422359	422360		
Sample Reference				TP135	TP136	TP136		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.00	0.25	0.75		
Date Sampled				19/02/2015	19/02/2015	19/02/2015		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	12	19		
Boron (water soluble)	mg/kg	0.2	MCERTS	0.3	0.9	0.3		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	5.3	15	4.5		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.8	20	15		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	7.5	44	13		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	6.5	12	7.1		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	35	74	40		
Monoaromatics								
Benzene	µg/kg	1	MCERTS	-	-	-		
Toluene	µg/kg	1	MCERTS	-	-	-		
Ethylbenzene	µg/kg	1	MCERTS	-	-	-		
p & m-xylene	µg/kg	1	MCERTS	-	-	-		
o-xylene	µg/kg	1	MCERTS	-	-	-		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-		
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-		

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
422328	BH101	None Supplied	0.50	Light brown sand.
422329	BH101	None Supplied	1.00	Brown sandy topsoil.
422330	TP123	None Supplied	0.50	Beige sand.
422331	TP123	None Supplied	1.00	Beige sand.
422332	TP124	None Supplied	0.50	Light brown sand.
422333	WS142	None Supplied	0.50-0.60	Black sandy topsoil with gravel and brick.
422334	WS148	None Supplied	0.50-0.60	Brown sandy topsoil with gravel and vegetation.
422335	WS147	None Supplied	0.20-0.30	Brown sandy topsoil with gravel and rubble.
422336	TP133	None Supplied	0.20	Red sand with brick.
422337	TP133	None Supplied	0.40	Black topsoil and gravel with clinker.
422338	TP127	None Supplied	0.20	Beige sand.
422339	TP128	None Supplied	0.25	Light brown sand.
422340	WS144	None Supplied	0.35-0.50	Light brown sand.
422341	TP125	None Supplied	0.20	Black sandy topsoil with gravel.
422342	TP125	None Supplied	1.00	Light brown sand.
422343	TP126	None Supplied	0.50	Light brown sand.
422344	TP134	None Supplied	0.20	Light brown sand with rubble and brick.
422345	TP137	None Supplied	0.20	Light brown sand with rubble.
422346	TP137	None Supplied	0.50	Brown topsoil and clay with vegetation.
422347	TP129	None Supplied	0.50	Light brown sand.
422348	TP132	None Supplied	0.20	Brown topsoil and gracvel with clinker and brick.
422349	TP132	None Supplied	0.40	Black topsoil and gravel with brick.
422350	WS141	None Supplied	0.30-0.50	Light brown sand.
422351	WS141	None Supplied	1.20-1.40	Beige sand.
422352	WS145	None Supplied	0.15-0.25	Brown topsoil and gracvel with clinker and brick.
422353	WS146	None Supplied	0.30-0.50	Brown topsoil and gracvel with clinker and brick.
422354	WS143	None Supplied	0.20-0.30	Light grey sandy topsoil with rubble.
422355	WS143	None Supplied	1.10-1.20	Beige sand.
422356	TP130	None Supplied	0.50	Beige sand.
422357	TP130	None Supplied	1.00	Beige sand.
422358	TP135	None Supplied	1.00	Beige sand.
422359	TP136	None Supplied	0.25	Light brown sand with rubble.
422360	TP136	None Supplied	0.75	Light brown sand.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Calorific Value of soil	Subcontracted.	Subcontracted analysis		W	NONE
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Loss on ignition of soil @ 450oC	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L047-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample results are not corrected for the stone content of the sample.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by extraction with water followed by ICP-OES. Results reported corrected for extraction ratio (soil equivalent) as g/l and mg/kg; and upon the 2:1 leachate (g/l)	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPHCWG (Soil)	Determination of pentane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

Preliminary Report Number : 15-67903

Project / Site name: Afan Lido, Port Talbot

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report are representative of the samples submitted for analysis.

ANNEX C

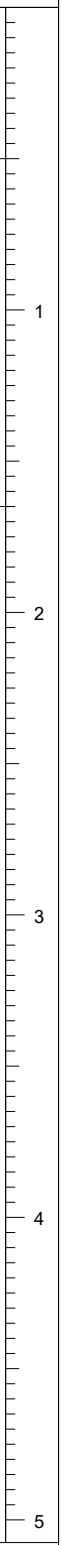
Trial Pit Logs

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP01-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 27/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.65	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.50			MADE GROUND. Grey gravelly SAND with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional metal and plastic.
				1.65			Light yellowish brown medium SAND. Dry.
							End of Pit at 1.650m



Stability:

Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP02-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 28/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.40	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.10			MADE GROUND. Grey gravelly SAND with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional metal and plastic.
							MADE GROUND. Light yellowish brown slightly gravelly SAND with low cobble content. Gravel and cobbles are clinker, slag and brick.
				0.80			Light yellowish brown medium SAND. Dry.
				1.40			End of Pit at 1.400m

Stability:

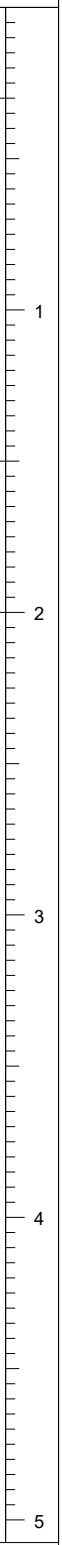
Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP03-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 28/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 2.00	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.30			MADE GROUND. Grey gravelly SAND with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional metal and plastic.
				1.50			MADE GROUND. Light brown slightly gravelly SAND. Gravel is angular sandstone and clinker.
				2.00			Light yellowish brown medium SAND. Dry.
							End of Pit at 2.000m



Stability:

Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP04-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 28/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.70	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15			MADE GROUND. Grass over brown organic-rich clayey SAND.
				1.00			MADE GROUND. Light brown clayey gravelly SAND with low cobble content. Gravel and cobbles are angular brick and sandstone.
				1.70			Light yellowish brown slightly gravelly SAND. Gravel is angular sandstone. Dry.
							End of Pit at 1.700m

Stability:

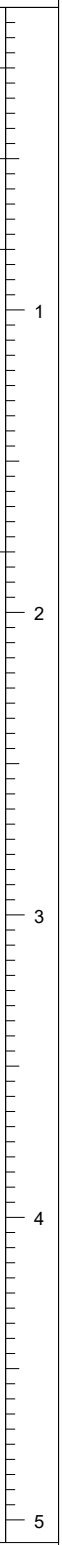
Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP05-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 28/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.80	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			MADE GROUND. Grass over brown organic-rich silty SAND.
				0.50			MADE GROUND. Soft brown sandy slightly gravelly CLAY. Gravel is angular sandstone and mudstone.
				0.80			MADE GROUND. Dark grey ashy silty slightly gravelly SAND. Gravel is angular clinker. Many glass and plastic fragments.
				1.80			Light yellowish brown medium SAND. Dry.
							End of Pit at 1.800m



Stability:

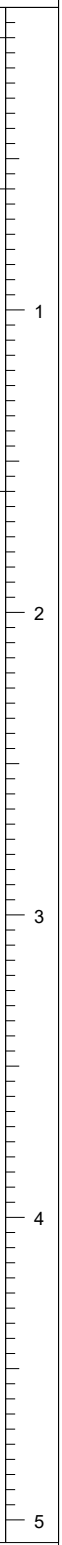
Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP06-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 28/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.60	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10			ASPHALT
				0.60			MADE GROUND. Reddish brown slightly gravelly ashy SAND. Gravel is angular clinker
				1.60			Light yellowish brown medium SAND. Moist.
							End of Pit at 1.600m



Stability:

Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No:
TP07-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 29/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.80	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.30			MADE GROUND. Grey very sandy GRAVEL with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional wood and metal fragments.
							CONCRETE with three layers of reinforcement.
				1.20			Light yellowish brown medium SAND. Dry.
				1.80			End of Pit at 1.800m

Stability:

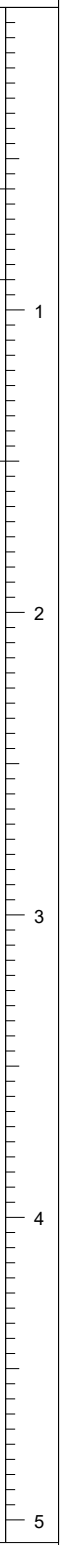
Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP08-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 29/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.50	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
							MADE GROUND. Grey very sandy GRAVEL with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional wood and metal fragments.
				0.60			CONCRETE with two layers of reinforcement. Underlain by black plastic membrane.
				0.90			Light yellowish brown medium SAND. Dry.
				1.50			End of Pit at 1.500m



Stability:

Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP09-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 29/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 1.60	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND. Grey very sandy GRAVEL with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional wood and metal fragments.
				0.80			CONCRETE with one layer of reinforcement.
				1.10			Light yellowish brown medium SAND. Dry.
				1.60			End of Pit at 1.600m

Stability:

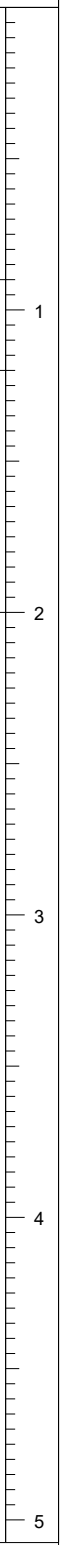
Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP10-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 29/01/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 2.00	Scale: 1:25
Client: Persimmon Homes West Wales			Logged:

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND. Grey very sandy GRAVEL with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional wood and metal fragments.
				0.90			CONCRETE with one layer of reinforcement.
				1.20			Light yellowish brown medium SAND. Dry.
				2.00			End of Pit at 2.000m



Stability:

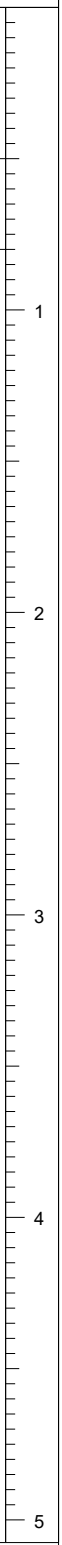
Remarks:

terrafirma
Tel: 02920 735354
info@terrafirmawales.co.uk
www.terrafirmawales.co.uk
Terra Firma (Wales) Limited
5 Deryn Court, Wharfedale Road
Pentwyn, Cardiff
CF23 7HA

Trial Pit No: TP11-2020
Sheet 1 of 1

Project Name: Afan Lido	Project No: 14647	Co-ords: - Level:	Date: 19/02/2020
Location: Aberavon, Neath Port Talbot		Dimensions: Depth 0.80 (1.00 × 0.70)	Scale: 1:25
Client: Persimmon Homes West Wales			Logged: MW

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
							MADE GROUND. Grey gravelly SAND with medium cobble content. Gravel and cobbles are angular concrete and brick. Occasional metal and plastic.
				0.50			MADE GROUND. Light brown slightly gravelly SAND. Gravel is angular sandstone and clinker.
				0.80			End of Pit at 0.800m



Stability: Spalling sides

Remarks:

ANNEX D

Laboratory Soil Chemical Test Results

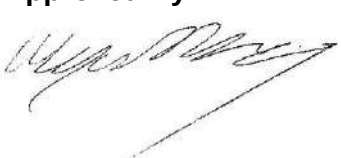
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-03301-1
Initial Date of Issue:	10-Feb-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	michael@terrafirmawales.co.uk
Project	Afan Lido

Quotation No.:	Q18-15369	**Date Received:**	03-Feb-2020
Order No.:	14647-MW	**Date Instructed:**	04-Feb-2020
No. of Samples:	4		
Turnaround (Wkdays):	5	**Results Due:**	10-Feb-2020
Date Approved:	10-Feb-2020		

Approved By:



Details: Glynn Harvey, Laboratory Manager

Results - Soil

Project: Afan Lido

Client: Terra Firma (Wales) Ltd			**Chemtest Job No.:**		20-03301	20-03301	20-03301	20-03301
Quotation No.: Q18-15369			**Chemtest Sample ID.:**		963089	963090	963091	963092
			Client Sample ID.:		TP07-2020	TP08-2020	TP09-2020	TP10-2020
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		1.5	1.2	1.5	1.5
			Date Sampled:		31-Jan-2020	31-Jan-2020	31-Jan-2020	31-Jan-2020
			Time Sampled:		12:00	12:00	12:00	12:00
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-

Test Methods

SOP	Title	Parameters included	Method summary
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

ANNEX E

Laboratory Soil Leachate Chemical Test Results

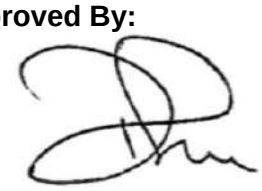
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	20-05474-1
Initial Date of Issue:	27-Feb-2020
Client	Terra Firma (Wales) Ltd
Client Address:	5 Deryn Court Wharfedale Road Pentwyn Cardiff CF23 7HA
Contact(s):	Michael Watkins
Project	14647-MW Afan Lido

Quotation No.:		**Date Received:**	20-Feb-2020
Order No.:		**Date Instructed:**	20-Feb-2020
No. of Samples:	6		
Turnaround (Wkdays):	5	**Results Due:**	26-Feb-2020
Date Approved:	27-Feb-2020		

Approved By:



Details: Darrell Hall, Director

Results - Leachate

Project: 14647-MW Afan Lido

Client: Terra Firma (Wales) Ltd				**Chemtest Job No.:**		20-05474	20-05474	20-05474	20-05474	20-05474	20-05474
Quotation No.:				**Chemtest Sample ID.:**		973136	973137	973138	973139	973140	973141
				Sample Location:		TP01-20	TP02-20	TP02-20	TP03-20	TP03-20	TP11-20
				Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.10	0.10	0.60	0.40	0.80	0.60
				Date Sampled:		19-Feb-2020	19-Feb-2020	19-Feb-2020	19-Feb-2020	19-Feb-2020	19-Feb-2020
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**						
Arsenic (Dissolved)	U	1450	2:1	µg/l	1.0	14	11	4.3	12	11	1.2
Cadmium (Dissolved)	U	1450	2:1	µg/l	0.080	< 0.080	0.27	< 0.080	0.10	< 0.080	< 0.080
Copper (Dissolved)	U	1450	2:1	µg/l	1.0	19	13	< 1.0	< 1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450	2:1	µg/l	1.0	< 1.0	1.8	< 1.0	5.1	5.8	< 1.0
Zinc (Dissolved)	U	1450	2:1	µg/l	1.0	16	16	< 1.0	< 1.0	< 1.0	< 1.0
Naphthalene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluorene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Anthracene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Pyrene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chrysene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	2:1	µg/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	2:1	µg/l	0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

Test Methods

SOP	Title	Parameters included	Method summary
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge
650	Characterisation of Waste (Leaching WAC)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

ANNEX F

In-situ Soakaway Test Results

SOAKAWAY TEST

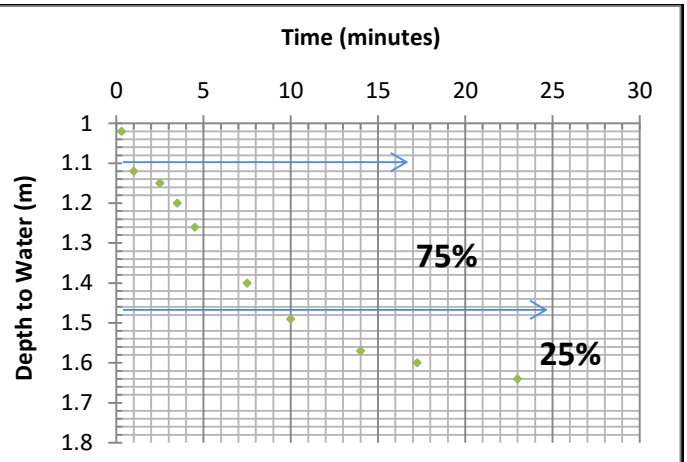
Site Name: Afan Lido
Project Number: 14647
Date: 27/01/2020

Trial Pit: **TP01-2020**

TEST 1

Length	1.90	m
Bredth	0.90	m
Depth	1.65	m
Fill Level	0.92	m
V_{p75-25}	0.187	m^3
a_{p50}	3.754	m^2
t_{p75-25}	8	minutes

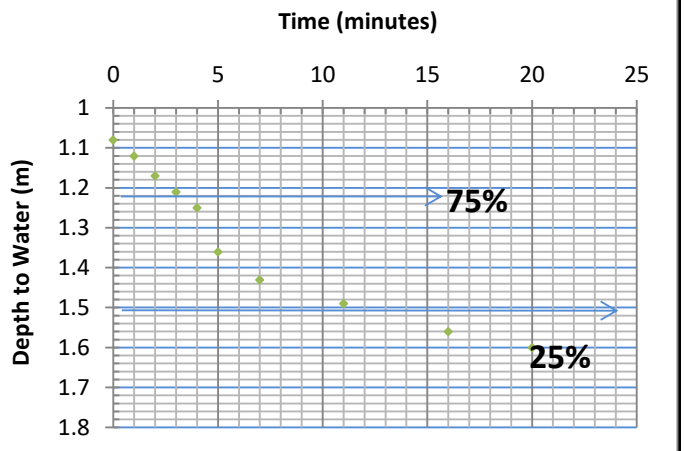
Soil Infiltration Rate, f **1.04E-04** **ms^{-1}**
Backfilled with 40mm clean gravel



TEST 2

Length	1.90	m
Bredth	0.90	m
Depth	1.65	m
Fill Level	1.08	m
V_{p75-25}	0.146	m^3
a_{p50}	3.306	m^2
t_{p75-25}	8.05	minutes

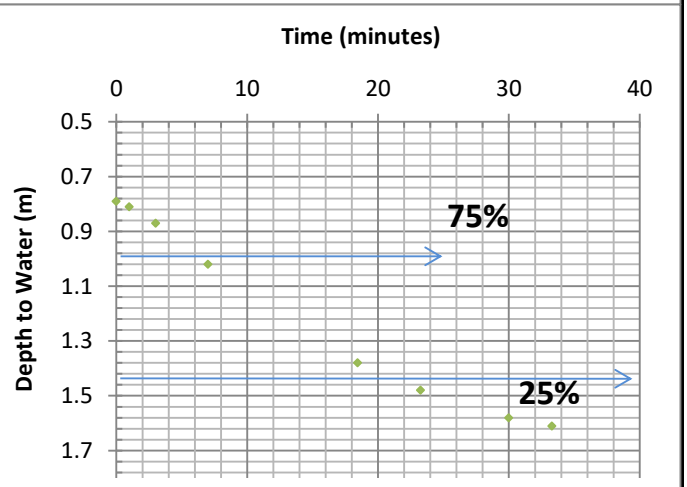
Soil Infiltration Rate, f **9.16E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



TEST 3

Length	1.30	m
Bredth	0.60	m
Depth	1.65	m
Fill Level	0.79	m
V_{p75-25}	0.101	m^3
a_{p50}	2.414	m^2
t_{p75-25}	15	minutes

Soil Infiltration Rate, f **4.63E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



REMARKS:
Test carried out in accordance with BRE DIGEST 365 (2016)
Gravel backfill porosity of 30%

SOAKAWAY TEST

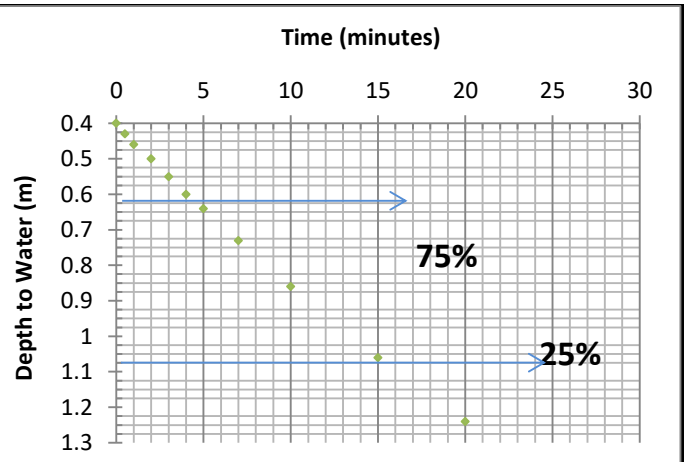
Site Name: Afan Lido
Project Number: 14647
Date: 28/01/2020

Trial Pit: **TP02-2020**

TEST 1

Length	1.50	m
Bredth	0.70	m
Depth	1.30	m
Fill Level	0.40	m
V_{p75-25}	0.142	m^3
a_{p50}	3.03	m^2
t_{p75-25}	11	minutes

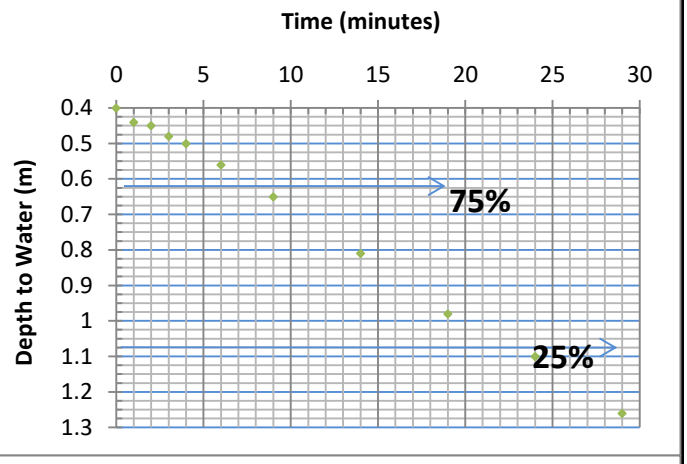
Soil Infiltration Rate, f **7.09E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



TEST 2

Length	1.50	m
Bredth	0.70	m
Depth	1.30	m
Fill Level	0.40	m
V_{p75-25}	0.142	m^3
a_{p50}	3.03	m^2
t_{p75-25}	14	minutes

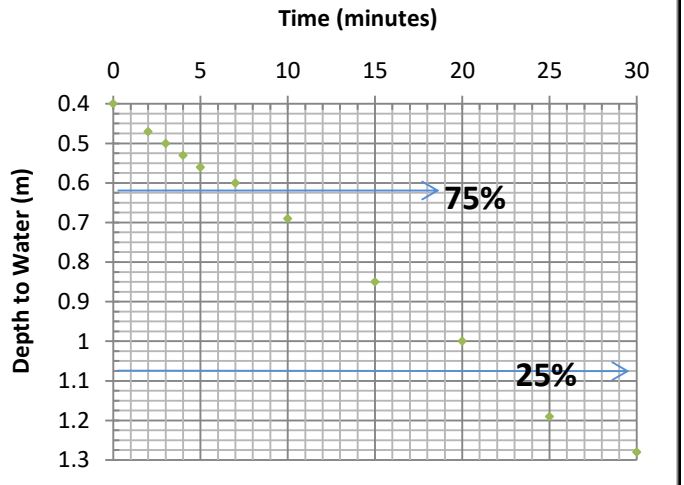
Soil Infiltration Rate, f **5.57E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



TEST 3

Length	1.50	m
Bredth	0.70	m
Depth	1.30	m
Fill Level	0.40	m
V_{p75-25}	0.142	m^3
a_{p50}	3.03	m^2
t_{p75-25}	14.5	minutes

Soil Infiltration Rate, f **5.38E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



REMARKS:
Test carried out in accordance with BRE DIGEST 365 (2016)
Gravel backfill porosity of 30%

SOAKAWAY TEST

Site Name: Afan Lido
Project Number: 14647
Date: 28/01/2020

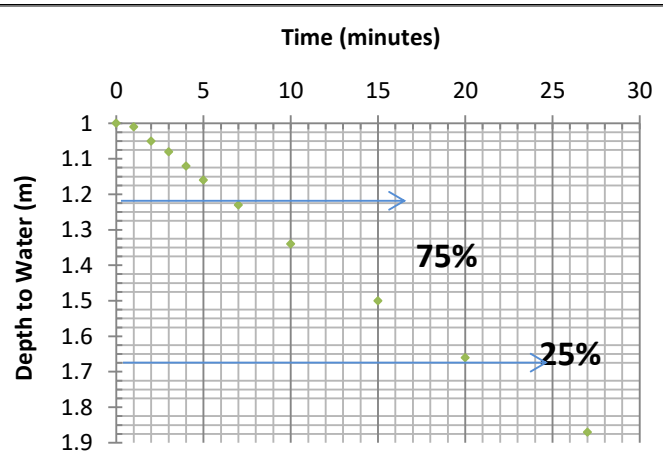
Trial Pit: **TP03-2020**

TEST 1

Length	1.50	m
Bredth	0.70	m
Depth	1.90	m
Fill Level	1.00	m

V_{p75-25}	0.142	m^3
a_{p50}	3.03	m^2
t_{p75-25}	13.75	minutes

Soil Infiltration Rate, f **5.67E-05** **ms^{-1}**
Backfilled with 40mm clean gravel

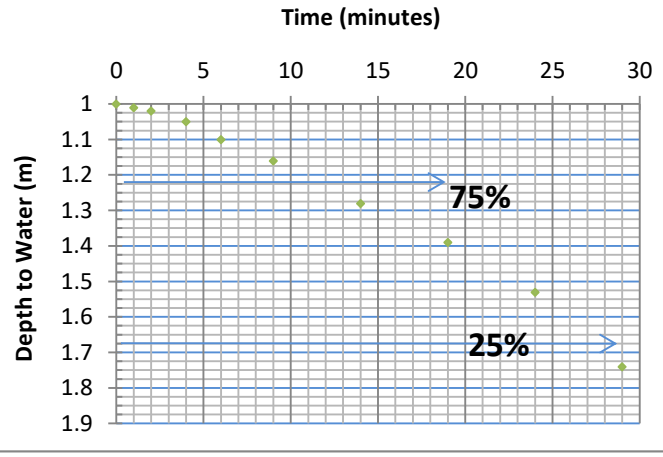


TEST 2

Length	1.50	m
Bredth	0.70	m
Depth	1.90	m
Fill Level	1.00	m

V_{p75-25}	0.142	m^3
a_{p50}	3.03	m^2
t_{p75-25}	16	minutes

Soil Infiltration Rate, f **4.87E-05** **ms^{-1}**
Backfilled with 40mm clean gravel

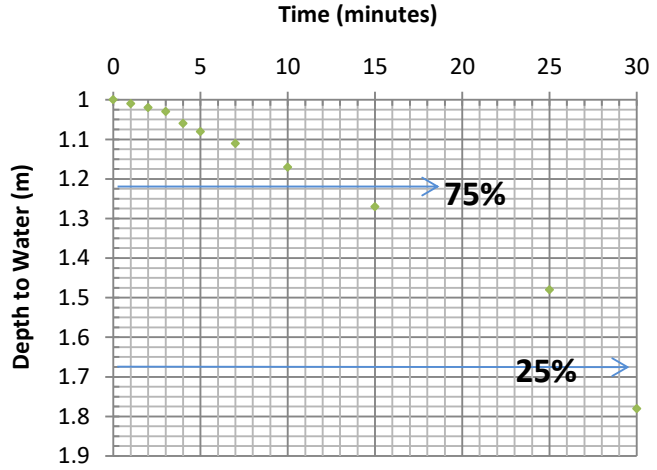


TEST 3

Length	1.50	m
Bredth	0.70	m
Depth	1.90	m
Fill Level	1.00	m

V_{p75-25}	0.142	m^3
a_{p50}	3.03	m^2
t_{p75-25}	15.5	minutes

Soil Infiltration Rate, f **5.03E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



REMARKS:
Test carried out in accordance with BRE DIGEST 365 (2016)
Gravel backfill porosity of 30%

SOAKAWAY TEST

Site Name: Afan Lido
Project Number: 14647
Date: 28/01/2020

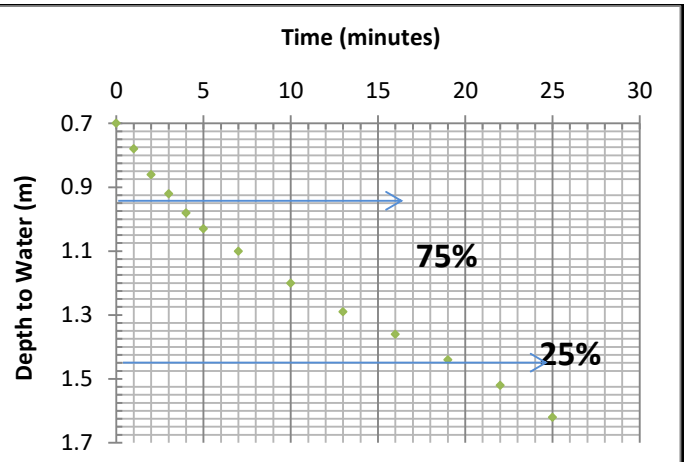
Trial Pit: **TP04-2020**

TEST 1

Length	1.50	m
Bredth	0.70	m
Depth	1.70	m
Fill Level	0.70	m

V_{p75-25}	0.158	m^3
a_{p50}	3.25	m^2
t_{p75-25}	16	minutes

Soil Infiltration Rate, f **5.05E-05** **ms^{-1}**
Backfilled with 40mm clean gravel

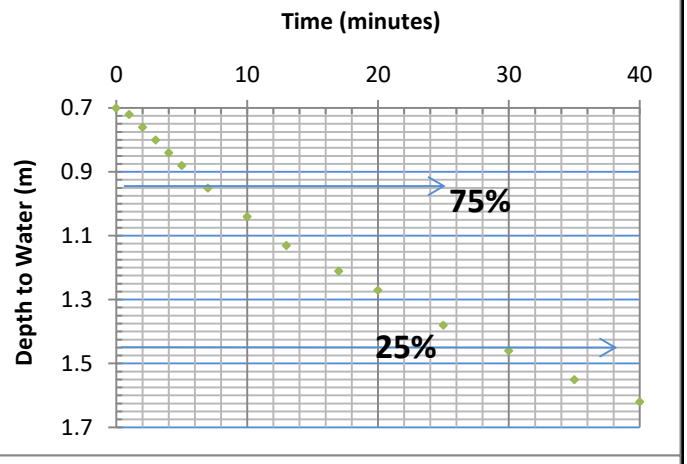


TEST 2

Length	1.50	m
Bredth	0.70	m
Depth	1.70	m
Fill Level	0.70	m

V_{p75-25}	0.158	m^3
a_{p50}	3.25	m^2
t_{p75-25}	22.5	minutes

Soil Infiltration Rate, f **3.59E-05** **ms^{-1}**
Backfilled with 40mm clean gravel

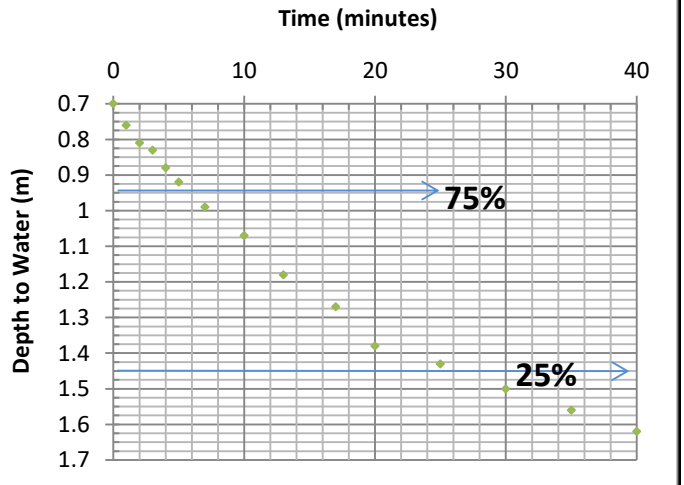


TEST 3

Length	1.50	m
Bredth	0.70	m
Depth	1.70	m
Fill Level	0.70	m

V_{p75-25}	0.158	m^3
a_{p50}	3.25	m^2
t_{p75-25}	20	minutes

Soil Infiltration Rate, f **4.04E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



REMARKS:
Test carried out in accordance with BRE DIGEST 365 (2016)
Gravel backfill porosity of 30%

SOAKAWAY TEST

Site Name: Afan Lido
Project Number: 14647
Date: 29/01/2020

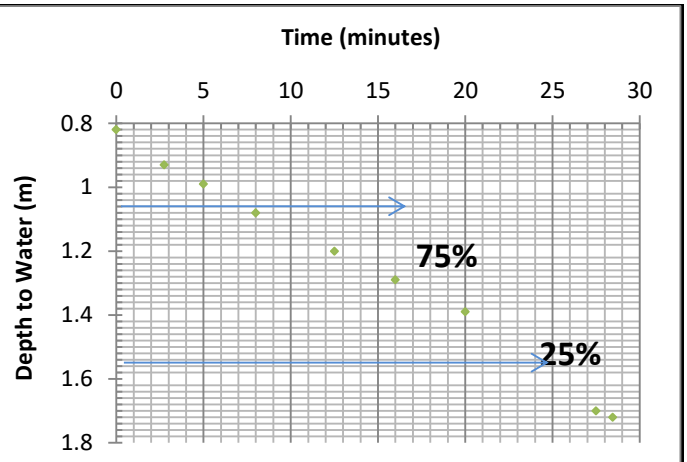
Trial Pit: **TP05-2020**

TEST 1

Length	1.80	m
Bredth	0.70	m
Depth	1.80	m
Fill Level	0.82	m

V_{p75-25}	0.185	m^3
a_{p50}	3.71	m^2
t_{p75-25}	16	minutes

Soil Infiltration Rate, f **5.20E-05** **ms^{-1}**
Backfilled with 40mm clean gravel

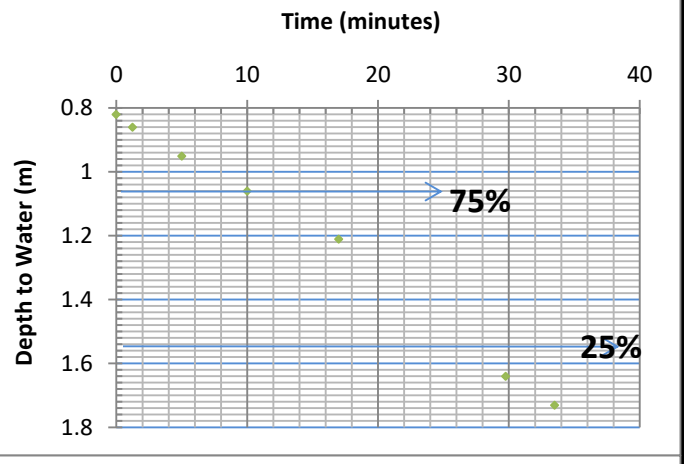


TEST 2

Length	1.80	m
Bredth	0.70	m
Depth	1.80	m
Fill Level	0.82	m

V_{p75-25}	0.185	m^3
a_{p50}	3.71	m^2
t_{p75-25}	13.5	minutes

Soil Infiltration Rate, f **6.16E-05** **ms^{-1}**
Backfilled with 40mm clean gravel

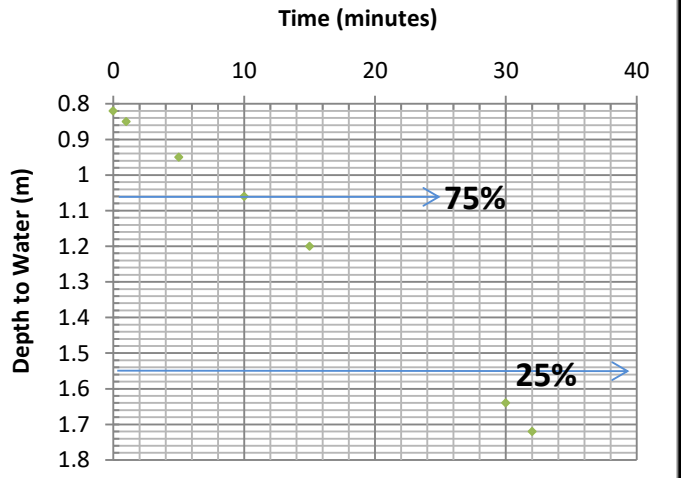


TEST 3

Length	1.80	m
Bredth	0.70	m
Depth	1.80	m
Fill Level	0.82	m

V_{p75-25}	0.185	m^3
a_{p50}	3.71	m^2
t_{p75-25}	13.5	minutes

Soil Infiltration Rate, f **6.16E-05** **ms^{-1}**
Backfilled with 40mm clean gravel



REMARKS:
Test carried out in accordance with BRE DIGEST 365 (2016)
Gravel backfill porosity of 30%

SOAKAWAY TEST

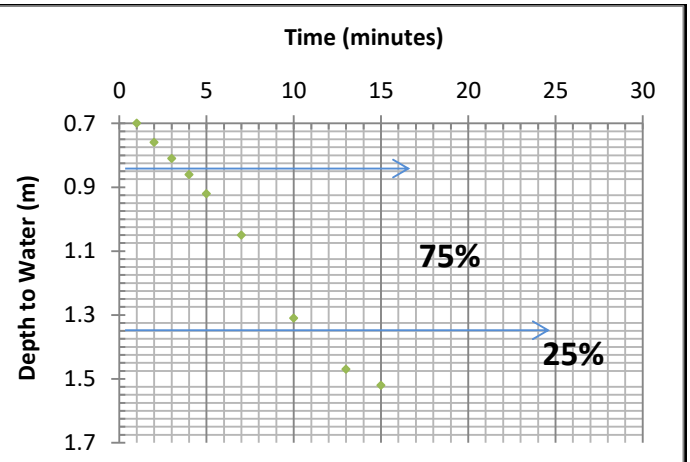
Site Name: Afan Lido
Project Number: 14647
Date: 29/01/2020

Trial Pit: **TP06-2020**

TEST 1

Length	1.80	m
Bredth	0.70	m
Depth	1.60	m
Fill Level	0.60	m
V_{p75-25}	0.189	m^3
a_{p50}	3.76	m^2
t_{p75-25}	6.75	minutes

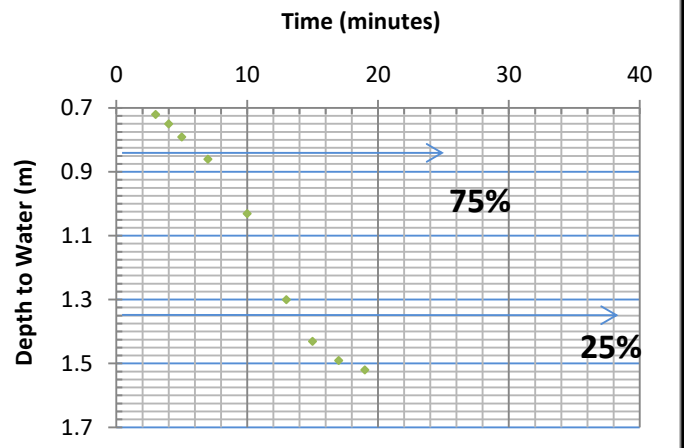
Soil Infiltration Rate, f **1.24E-04** **ms^{-1}**
Backfilled with 40mm clean gravel



TEST 2

Length	1.80	m
Bredth	0.70	m
Depth	1.60	m
Fill Level	0.60	m
V_{p75-25}	0.189	m^3
a_{p50}	3.76	m^2
t_{p75-25}	7	minutes

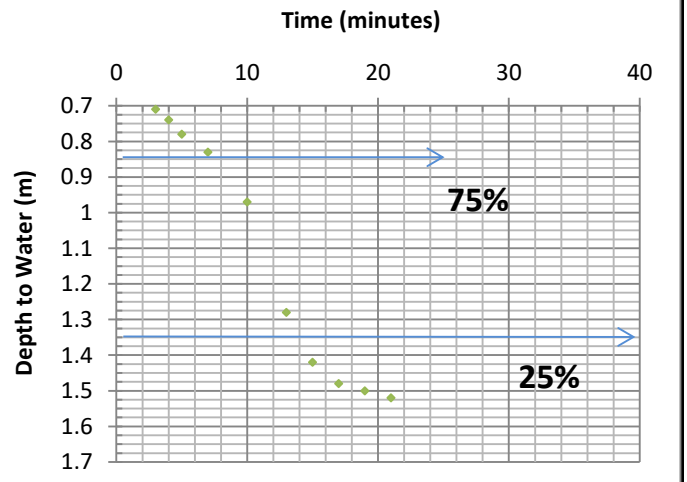
Soil Infiltration Rate, f **1.20E-04** **ms^{-1}**
Backfilled with 40mm clean gravel



TEST 3

Length	1.80	m
Bredth	0.70	m
Depth	1.60	m
Fill Level	0.60	m
V_{p75-25}	0.189	m^3
a_{p50}	3.76	m^2
t_{p75-25}	6.5	minutes

Soil Infiltration Rate, f **1.29E-04** **ms^{-1}**
Backfilled with 40mm clean gravel



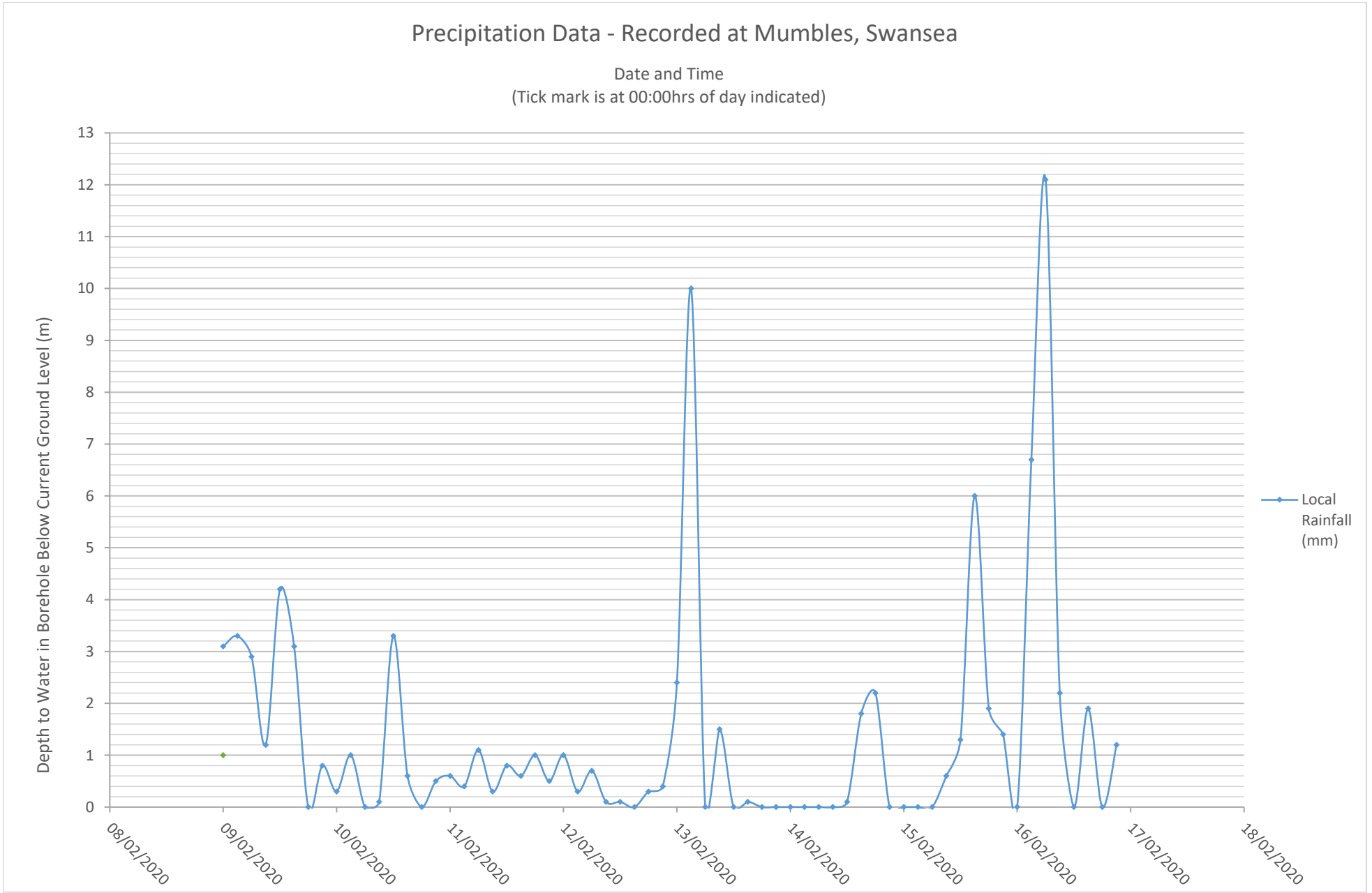
REMARKS:
Test carried out in accordance with BRE DIGEST 365 (2016)
Gravel backfill porosity of 30%

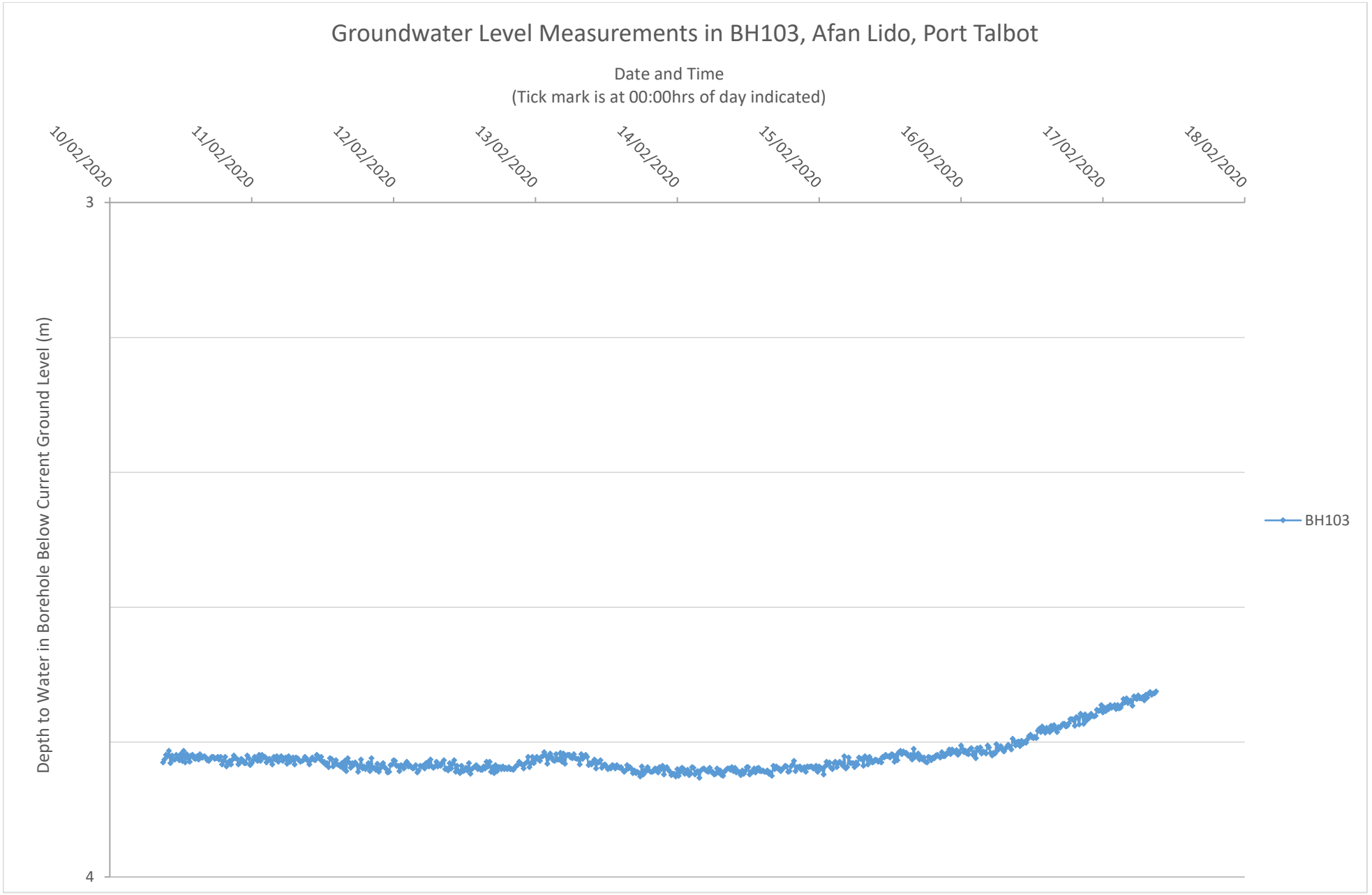
ANNEX G

Gas Monitoring Results

ANNEX H

Groundwater Monitoring Data


Precipitation Data - Recorded at Mumbles, Swansea
Date and Time
(Tick mark is at 00:00hrs of day indicated)
Depth to Water in Borehole Below Current Ground Level (m)
13
12
11
10
9
8
7
6
5
4
3
2
1
0
08/02/2020
09/02/2020
10/02/2020
11/02/2020
12/02/2020
13/02/2020
14/02/2020
15/02/2020
16/02/2020
17/02/2020
18/02/2020
Local Rainfall (mm)


Groundwater Level Measurements in BH103, Afan Lido, Port Talbot
Date and Time
(Tick mark is at 00:00hrs of day indicated)
10/02/2020
11/02/2020
12/02/2020
13/02/2020
14/02/2020
15/02/2020
16/02/2020
17/02/2020
18/02/2020
3
4
Depth to Water in Borehole Below Current Ground Level (m)
BH103

Date and Time	BH103
10/02/2020 09:00	3.83
10/02/2020 09:15	3.826
10/02/2020 09:30	3.819
10/02/2020 09:45	3.821
10/02/2020 10:00	3.813
10/02/2020 10:15	3.831
10/02/2020 10:30	3.82
10/02/2020 10:45	3.826
10/02/2020 11:00	3.826
10/02/2020 11:15	3.819
10/02/2020 11:30	3.823
10/02/2020 11:45	3.827
10/02/2020 12:00	3.818
10/02/2020 12:15	3.828
10/02/2020 12:30	3.813
10/02/2020 12:45	3.83
10/02/2020 13:00	3.818
10/02/2020 13:15	3.824
10/02/2020 13:30	3.829
10/02/2020 13:45	3.82
10/02/2020 14:00	3.819
10/02/2020 14:15	3.824
10/02/2020 14:30	3.825
10/02/2020 14:45	3.821
10/02/2020 15:00	3.826
10/02/2020 15:15	3.818
10/02/2020 15:30	3.823
10/02/2020 15:45	3.823
10/02/2020 16:00	3.821
10/02/2020 16:15	3.823
10/02/2020 16:30	3.827
10/02/2020 16:45	3.828
10/02/2020 17:00	3.825
10/02/2020 17:15	3.822
10/02/2020 17:30	3.822
10/02/2020 17:45	3.825
10/02/2020 18:00	3.824
10/02/2020 18:15	3.822
10/02/2020 18:30	3.826
10/02/2020 18:45	3.822
10/02/2020 19:00	3.833
10/02/2020 19:15	3.828
10/02/2020 19:30	3.822
10/02/2020 19:45	3.836
10/02/2020 20:00	3.83
10/02/2020 20:15	3.828
10/02/2020 20:30	3.833
10/02/2020 20:45	3.826

10/02/2020 21:00	3.82
10/02/2020 21:15	3.824
10/02/2020 21:30	3.825
10/02/2020 21:45	3.833
10/02/2020 22:00	3.83
10/02/2020 22:15	3.825
10/02/2020 22:30	3.827
10/02/2020 22:45	3.831
10/02/2020 23:00	3.831
10/02/2020 23:15	3.82
10/02/2020 23:30	3.824
10/02/2020 23:45	3.834
11/02/2020 00:00	3.831
11/02/2020 00:15	3.827
11/02/2020 00:30	3.822
11/02/2020 00:45	3.826
11/02/2020 01:00	3.828
11/02/2020 01:15	3.819
11/02/2020 01:30	3.828
11/02/2020 01:45	3.819
11/02/2020 02:00	3.823
11/02/2020 02:15	3.822
11/02/2020 02:30	3.83
11/02/2020 02:45	3.826
11/02/2020 03:00	3.825
11/02/2020 03:15	3.828
11/02/2020 03:30	3.833
11/02/2020 03:45	3.822
11/02/2020 04:00	3.826
11/02/2020 04:15	3.821
11/02/2020 04:30	3.829
11/02/2020 04:45	3.823
11/02/2020 05:00	3.821
11/02/2020 05:15	3.828
11/02/2020 05:30	3.825
11/02/2020 05:45	3.823
11/02/2020 06:00	3.832
11/02/2020 06:15	3.821
11/02/2020 06:30	3.829
11/02/2020 06:45	3.826
11/02/2020 07:00	3.823
11/02/2020 07:15	3.833
11/02/2020 07:30	3.823
11/02/2020 07:45	3.824
11/02/2020 08:00	3.827
11/02/2020 08:15	3.829
11/02/2020 08:30	3.828
11/02/2020 08:45	3.827
11/02/2020 09:00	3.822
11/02/2020 09:15	3.824

11/02/2020 09:30	3.828
11/02/2020 09:45	3.833
11/02/2020 10:00	3.827
11/02/2020 10:15	3.823
11/02/2020 10:30	3.826
11/02/2020 10:45	3.827
11/02/2020 11:00	3.819
11/02/2020 11:15	3.821
11/02/2020 11:30	3.825
11/02/2020 11:45	3.822
11/02/2020 12:00	3.829
11/02/2020 12:15	3.829
11/02/2020 12:30	3.833
11/02/2020 12:45	3.831
11/02/2020 13:00	3.837
11/02/2020 13:15	3.824
11/02/2020 13:30	3.825
11/02/2020 13:45	3.836
11/02/2020 14:00	3.831
11/02/2020 14:15	3.827
11/02/2020 14:30	3.833
11/02/2020 14:45	3.834
11/02/2020 15:00	3.836
11/02/2020 15:15	3.831
11/02/2020 15:30	3.839
11/02/2020 15:45	3.828
11/02/2020 16:00	3.843
11/02/2020 16:15	3.824
11/02/2020 16:30	3.83
11/02/2020 16:45	3.838
11/02/2020 17:00	3.831
11/02/2020 17:15	3.834
11/02/2020 17:30	3.83
11/02/2020 17:45	3.833
11/02/2020 18:00	3.844
11/02/2020 18:15	3.836
11/02/2020 18:30	3.826
11/02/2020 18:45	3.839
11/02/2020 19:00	3.836
11/02/2020 19:15	3.84
11/02/2020 19:30	3.836
11/02/2020 19:45	3.831
11/02/2020 20:00	3.843
11/02/2020 20:15	3.824
11/02/2020 20:30	3.838
11/02/2020 20:45	3.838
11/02/2020 21:00	3.841
11/02/2020 21:15	3.832
11/02/2020 21:30	3.844
11/02/2020 21:45	3.839

11/02/2020 22:00	3.834
11/02/2020 22:15	3.831
11/02/2020 22:30	3.837
11/02/2020 22:45	3.84
11/02/2020 23:00	3.845
11/02/2020 23:15	3.844
11/02/2020 23:30	3.834
11/02/2020 23:45	3.833
12/02/2020 00:00	3.827
12/02/2020 00:15	3.828
12/02/2020 00:30	3.835
12/02/2020 00:45	3.835
12/02/2020 01:00	3.843
12/02/2020 01:15	3.834
12/02/2020 01:30	3.837
12/02/2020 01:45	3.839
12/02/2020 02:00	3.832
12/02/2020 02:15	3.829
12/02/2020 02:30	3.836
12/02/2020 02:45	3.834
12/02/2020 03:00	3.837
12/02/2020 03:15	3.839
12/02/2020 03:30	3.838
12/02/2020 03:45	3.834
12/02/2020 04:00	3.845
12/02/2020 04:15	3.842
12/02/2020 04:30	3.835
12/02/2020 04:45	3.836
12/02/2020 05:00	3.835
12/02/2020 05:15	3.839
12/02/2020 05:30	3.831
12/02/2020 05:45	3.83
12/02/2020 06:00	3.836
12/02/2020 06:15	3.826
12/02/2020 06:30	3.836
12/02/2020 06:45	3.838
12/02/2020 07:00	3.836
12/02/2020 07:15	3.829
12/02/2020 07:30	3.836
12/02/2020 07:45	3.834
12/02/2020 08:00	3.835
12/02/2020 08:15	3.83
12/02/2020 08:30	3.827
12/02/2020 08:45	3.84
12/02/2020 09:00	3.839
12/02/2020 09:15	3.842
12/02/2020 09:30	3.831
12/02/2020 09:45	3.839
12/02/2020 10:00	3.832
12/02/2020 10:15	3.827

12/02/2020 10:30	3.844
12/02/2020 10:45	3.835
12/02/2020 11:00	3.843
12/02/2020 11:15	3.846
12/02/2020 11:30	3.835
12/02/2020 11:45	3.843
12/02/2020 12:00	3.842
12/02/2020 12:15	3.838
12/02/2020 12:30	3.842
12/02/2020 12:45	3.831
12/02/2020 13:00	3.847
12/02/2020 13:15	3.84
12/02/2020 13:30	3.838
12/02/2020 13:45	3.836
12/02/2020 14:00	3.834
12/02/2020 14:15	3.84
12/02/2020 14:30	3.838
12/02/2020 14:45	3.841
12/02/2020 15:00	3.841
12/02/2020 15:15	3.836
12/02/2020 15:30	3.839
12/02/2020 15:45	3.829
12/02/2020 16:00	3.836
12/02/2020 16:15	3.829
12/02/2020 16:30	3.844
12/02/2020 16:45	3.837
12/02/2020 17:00	3.846
12/02/2020 17:15	3.834
12/02/2020 17:30	3.843
12/02/2020 17:45	3.837
12/02/2020 18:00	3.837
12/02/2020 18:15	3.84
12/02/2020 18:30	3.836
12/02/2020 18:45	3.84
12/02/2020 19:00	3.838
12/02/2020 19:15	3.84
12/02/2020 19:30	3.837
12/02/2020 19:45	3.84
12/02/2020 20:00	3.84
12/02/2020 20:15	3.841
12/02/2020 20:30	3.838
12/02/2020 20:45	3.835
12/02/2020 21:00	3.834
12/02/2020 21:15	3.829
12/02/2020 21:30	3.832
12/02/2020 21:45	3.833
12/02/2020 22:00	3.839
12/02/2020 22:15	3.832
12/02/2020 22:30	3.83
12/02/2020 22:45	3.822

12/02/2020 23:00	3.837
12/02/2020 23:15	3.831
12/02/2020 23:30	3.822
12/02/2020 23:45	3.831
13/02/2020 00:00	3.826
13/02/2020 00:15	3.822
13/02/2020 00:30	3.826
13/02/2020 00:45	3.828
13/02/2020 01:00	3.822
13/02/2020 01:15	3.821
13/02/2020 01:30	3.815
13/02/2020 01:45	3.82
13/02/2020 02:00	3.832
13/02/2020 02:15	3.824
13/02/2020 02:30	3.817
13/02/2020 02:45	3.822
13/02/2020 03:00	3.827
13/02/2020 03:15	3.828
13/02/2020 03:30	3.818
13/02/2020 03:45	3.826
13/02/2020 04:00	3.826
13/02/2020 04:15	3.816
13/02/2020 04:30	3.829
13/02/2020 04:45	3.817
13/02/2020 05:00	3.832
13/02/2020 05:15	3.82
13/02/2020 05:30	3.819
13/02/2020 05:45	3.819
13/02/2020 06:00	3.823
13/02/2020 06:15	3.824
13/02/2020 06:30	3.818
13/02/2020 06:45	3.824
13/02/2020 07:00	3.825
13/02/2020 07:15	3.825
13/02/2020 07:30	3.833
13/02/2020 07:45	3.818
13/02/2020 08:00	3.825
13/02/2020 08:15	3.822
13/02/2020 08:30	3.819
13/02/2020 08:45	3.822
13/02/2020 09:00	3.834
13/02/2020 09:15	3.831
13/02/2020 09:30	3.833
13/02/2020 09:45	3.829
13/02/2020 10:00	3.826
13/02/2020 10:15	3.839
13/02/2020 10:30	3.83
13/02/2020 10:45	3.83
13/02/2020 11:00	3.827
13/02/2020 11:15	3.838

13/02/2020 11:30	3.834
13/02/2020 11:45	3.833
13/02/2020 12:00	3.836
13/02/2020 12:15	3.84
13/02/2020 12:30	3.838
13/02/2020 12:45	3.839
13/02/2020 13:00	3.834
13/02/2020 13:15	3.835
13/02/2020 13:30	3.839
13/02/2020 13:45	3.834
13/02/2020 14:00	3.837
13/02/2020 14:15	3.838
13/02/2020 14:30	3.837
13/02/2020 14:45	3.841
13/02/2020 15:00	3.844
13/02/2020 15:15	3.842
13/02/2020 15:30	3.834
13/02/2020 15:45	3.839
13/02/2020 16:00	3.837
13/02/2020 16:15	3.84
13/02/2020 16:30	3.846
13/02/2020 16:45	3.842
13/02/2020 17:00	3.846
13/02/2020 17:15	3.844
13/02/2020 17:30	3.846
13/02/2020 17:45	3.851
13/02/2020 18:00	3.836
13/02/2020 18:15	3.848
13/02/2020 18:30	3.842
13/02/2020 18:45	3.843
13/02/2020 19:00	3.837
13/02/2020 19:15	3.842
13/02/2020 19:30	3.844
13/02/2020 19:45	3.844
13/02/2020 20:00	3.843
13/02/2020 20:15	3.839
13/02/2020 20:30	3.84
13/02/2020 20:45	3.845
13/02/2020 21:00	3.837
13/02/2020 21:15	3.84
13/02/2020 21:30	3.835
13/02/2020 21:45	3.848
13/02/2020 22:00	3.839
13/02/2020 22:15	3.837
13/02/2020 22:30	3.841
13/02/2020 22:45	3.844
13/02/2020 23:00	3.849
13/02/2020 23:15	3.847
13/02/2020 23:30	3.847
13/02/2020 23:45	3.851

14/02/2020 00:00	3.84
14/02/2020 00:15	3.85
14/02/2020 00:30	3.844
14/02/2020 00:45	3.838
14/02/2020 01:00	3.839
14/02/2020 01:15	3.847
14/02/2020 01:30	3.845
14/02/2020 01:45	3.841
14/02/2020 02:00	3.849
14/02/2020 02:15	3.846
14/02/2020 02:30	3.837
14/02/2020 02:45	3.838
14/02/2020 03:00	3.848
14/02/2020 03:15	3.844
14/02/2020 03:30	3.843
14/02/2020 03:45	3.853
14/02/2020 04:00	3.842
14/02/2020 04:15	3.84
14/02/2020 04:30	3.839
14/02/2020 04:45	3.841
14/02/2020 05:00	3.843
14/02/2020 05:15	3.844
14/02/2020 05:30	3.838
14/02/2020 05:45	3.844
14/02/2020 06:00	3.844
14/02/2020 06:15	3.848
14/02/2020 06:30	3.847
14/02/2020 06:45	3.839
14/02/2020 07:00	3.845
14/02/2020 07:15	3.842
14/02/2020 07:30	3.849
14/02/2020 07:45	3.85
14/02/2020 08:00	3.844
14/02/2020 08:15	3.841
14/02/2020 08:30	3.839
14/02/2020 08:45	3.839
14/02/2020 09:00	3.841
14/02/2020 09:15	3.837
14/02/2020 09:30	3.843
14/02/2020 09:45	3.838
14/02/2020 10:00	3.845
14/02/2020 10:15	3.843
14/02/2020 10:30	3.845
14/02/2020 10:45	3.849
14/02/2020 11:00	3.842
14/02/2020 11:15	3.847
14/02/2020 11:30	3.843
14/02/2020 11:45	3.837
14/02/2020 12:00	3.837
14/02/2020 12:15	3.848

14/02/2020 12:30	3.844
14/02/2020 12:45	3.844
14/02/2020 13:00	3.839
14/02/2020 13:15	3.845
14/02/2020 13:30	3.839
14/02/2020 13:45	3.838
14/02/2020 14:00	3.843
14/02/2020 14:15	3.843
14/02/2020 14:30	3.842
14/02/2020 14:45	3.844
14/02/2020 15:00	3.844
14/02/2020 15:15	3.842
14/02/2020 15:30	3.847
14/02/2020 15:45	3.845
14/02/2020 16:00	3.85
14/02/2020 16:15	3.835
14/02/2020 16:30	3.84
14/02/2020 16:45	3.836
14/02/2020 17:00	3.839
14/02/2020 17:15	3.839
14/02/2020 17:30	3.843
14/02/2020 17:45	3.84
14/02/2020 18:00	3.838
14/02/2020 18:15	3.835
14/02/2020 18:30	3.836
14/02/2020 18:45	3.844
14/02/2020 19:00	3.843
14/02/2020 19:15	3.836
14/02/2020 19:30	3.833
14/02/2020 19:45	3.828
14/02/2020 20:00	3.843
14/02/2020 20:15	3.837
14/02/2020 20:30	3.837
14/02/2020 20:45	3.836
14/02/2020 21:00	3.841
14/02/2020 21:15	3.839
14/02/2020 21:30	3.837
14/02/2020 21:45	3.844
14/02/2020 22:00	3.836
14/02/2020 22:15	3.837
14/02/2020 22:30	3.836
14/02/2020 22:45	3.836
14/02/2020 23:00	3.839
14/02/2020 23:15	3.839
14/02/2020 23:30	3.835
14/02/2020 23:45	3.844
15/02/2020 00:00	3.836
15/02/2020 00:15	3.839
15/02/2020 00:30	3.839
15/02/2020 00:45	3.848

15/02/2020 01:00	3.836
15/02/2020 01:15	3.829
15/02/2020 01:30	3.833
15/02/2020 01:45	3.83
15/02/2020 02:00	3.838
15/02/2020 02:15	3.84
15/02/2020 02:30	3.831
15/02/2020 02:45	3.829
15/02/2020 03:00	3.837
15/02/2020 03:15	3.831
15/02/2020 03:30	3.829
15/02/2020 03:45	3.832
15/02/2020 04:00	3.835
15/02/2020 04:15	3.821
15/02/2020 04:30	3.839
15/02/2020 04:45	3.837
15/02/2020 05:00	3.823
15/02/2020 05:15	3.831
15/02/2020 05:30	3.831
15/02/2020 05:45	3.831
15/02/2020 06:00	3.837
15/02/2020 06:15	3.83
15/02/2020 06:30	3.833
15/02/2020 06:45	3.823
15/02/2020 07:00	3.825
15/02/2020 07:15	3.825
15/02/2020 07:30	3.835
15/02/2020 07:45	3.821
15/02/2020 08:00	3.824
15/02/2020 08:15	3.833
15/02/2020 08:30	3.822
15/02/2020 08:45	3.826
15/02/2020 09:00	3.83
15/02/2020 09:15	3.829
15/02/2020 09:30	3.826
15/02/2020 09:45	3.827
15/02/2020 10:00	3.829
15/02/2020 10:15	3.827
15/02/2020 10:30	3.83
15/02/2020 10:45	3.822
15/02/2020 11:00	3.823
15/02/2020 11:15	3.819
15/02/2020 11:30	3.821
15/02/2020 11:45	3.821
15/02/2020 12:00	3.823
15/02/2020 12:15	3.818
15/02/2020 12:30	3.819
15/02/2020 12:45	3.829
15/02/2020 13:00	3.82
15/02/2020 13:15	3.827

15/02/2020 13:30	3.815
15/02/2020 13:45	3.813
15/02/2020 14:00	3.818
15/02/2020 14:15	3.814
15/02/2020 14:30	3.816
15/02/2020 14:45	3.816
15/02/2020 15:00	3.82
15/02/2020 15:15	3.821
15/02/2020 15:30	3.819
15/02/2020 15:45	3.826
15/02/2020 16:00	3.81
15/02/2020 16:15	3.822
15/02/2020 16:30	3.821
15/02/2020 16:45	3.817
15/02/2020 17:00	3.826
15/02/2020 17:15	3.822
15/02/2020 17:30	3.826
15/02/2020 17:45	3.823
15/02/2020 18:00	3.829
15/02/2020 18:15	3.83
15/02/2020 18:30	3.822
15/02/2020 18:45	3.823
15/02/2020 19:00	3.827
15/02/2020 19:15	3.823
15/02/2020 19:30	3.824
15/02/2020 19:45	3.82
15/02/2020 20:00	3.819
15/02/2020 20:15	3.821
15/02/2020 20:30	3.823
15/02/2020 20:45	3.815
15/02/2020 21:00	3.821
15/02/2020 21:15	3.821
15/02/2020 21:30	3.817
15/02/2020 21:45	3.817
15/02/2020 22:00	3.811
15/02/2020 22:15	3.818
15/02/2020 22:30	3.811
15/02/2020 22:45	3.814
15/02/2020 23:00	3.815
15/02/2020 23:15	3.812
15/02/2020 23:30	3.819
15/02/2020 23:45	3.816
16/02/2020 00:00	3.805
16/02/2020 00:15	3.81
16/02/2020 00:30	3.815
16/02/2020 00:45	3.813
16/02/2020 01:00	3.817
16/02/2020 01:15	3.818
16/02/2020 01:30	3.811
16/02/2020 01:45	3.809

16/02/2020 02:00	3.819
16/02/2020 02:15	3.815
16/02/2020 02:30	3.824
16/02/2020 02:45	3.809
16/02/2020 03:00	3.812
16/02/2020 03:15	3.808
16/02/2020 03:30	3.817
16/02/2020 03:45	3.814
16/02/2020 04:00	3.815
16/02/2020 04:15	3.817
16/02/2020 04:30	3.805
16/02/2020 04:45	3.808
16/02/2020 05:00	3.816
16/02/2020 05:15	3.82
16/02/2020 05:30	3.816
16/02/2020 05:45	3.817
16/02/2020 06:00	3.803
16/02/2020 06:15	3.812
16/02/2020 06:30	3.808
16/02/2020 06:45	3.806
16/02/2020 07:00	3.811
16/02/2020 07:15	3.814
16/02/2020 07:30	3.81
16/02/2020 07:45	3.807
16/02/2020 08:00	3.804
16/02/2020 08:15	3.807
16/02/2020 08:30	3.811
16/02/2020 08:45	3.795
16/02/2020 09:00	3.799
16/02/2020 09:15	3.805
16/02/2020 09:30	3.8
16/02/2020 09:45	3.799
16/02/2020 10:00	3.806
16/02/2020 10:15	3.798
16/02/2020 10:30	3.802
16/02/2020 10:45	3.8
16/02/2020 11:00	3.801
16/02/2020 11:15	3.796
16/02/2020 11:30	3.791
16/02/2020 11:45	3.789
16/02/2020 12:00	3.793
16/02/2020 12:15	3.794
16/02/2020 12:30	3.792
16/02/2020 12:45	3.794
16/02/2020 13:00	3.783
16/02/2020 13:15	3.78
16/02/2020 13:30	3.785
16/02/2020 13:45	3.777
16/02/2020 14:00	3.781
16/02/2020 14:15	3.786

16/02/2020 14:30	3.779
16/02/2020 14:45	3.781
16/02/2020 15:00	3.785
16/02/2020 15:15	3.776
16/02/2020 15:30	3.781
16/02/2020 15:45	3.775
16/02/2020 16:00	3.781
16/02/2020 16:15	3.785
16/02/2020 16:30	3.778
16/02/2020 16:45	3.779
16/02/2020 17:00	3.776
16/02/2020 17:15	3.773
16/02/2020 17:30	3.773
16/02/2020 17:45	3.777
16/02/2020 18:00	3.776
16/02/2020 18:15	3.772
16/02/2020 18:30	3.766
16/02/2020 18:45	3.766
16/02/2020 19:00	3.767
16/02/2020 19:15	3.776
16/02/2020 19:30	3.763
16/02/2020 19:45	3.764
16/02/2020 20:00	3.774
16/02/2020 20:15	3.758
16/02/2020 20:30	3.761
16/02/2020 20:45	3.773
16/02/2020 21:00	3.759
16/02/2020 21:15	3.768
16/02/2020 21:30	3.762
16/02/2020 21:45	3.764
16/02/2020 22:00	3.758
16/02/2020 22:15	3.761
16/02/2020 22:30	3.762
16/02/2020 22:45	3.761
16/02/2020 23:00	3.752
16/02/2020 23:15	3.754
16/02/2020 23:30	3.753
16/02/2020 23:45	3.745
17/02/2020 00:00	3.756
17/02/2020 00:15	3.749
17/02/2020 00:30	3.754
17/02/2020 00:45	3.748
17/02/2020 01:00	3.751
17/02/2020 01:15	3.745
17/02/2020 01:30	3.749
17/02/2020 01:45	3.747
17/02/2020 02:00	3.745
17/02/2020 02:15	3.751
17/02/2020 02:30	3.745
17/02/2020 02:45	3.75

17/02/2020 03:00	3.749
17/02/2020 03:15	3.744
17/02/2020 03:30	3.736
17/02/2020 03:45	3.741
17/02/2020 04:00	3.735
17/02/2020 04:15	3.742
17/02/2020 04:30	3.74
17/02/2020 04:45	3.738
17/02/2020 05:00	3.746
17/02/2020 05:15	3.732
17/02/2020 05:30	3.735
17/02/2020 05:45	3.736
17/02/2020 06:00	3.731
17/02/2020 06:15	3.735
17/02/2020 06:30	3.735
17/02/2020 06:45	3.733
17/02/2020 07:00	3.738
17/02/2020 07:15	3.73
17/02/2020 07:30	3.734
17/02/2020 07:45	3.728
17/02/2020 08:00	3.726
17/02/2020 08:15	3.73
17/02/2020 08:30	3.728
17/02/2020 08:45	3.728
17/02/2020 09:00	3.725

ANNEX I

Thomas Research Services Report

TRS REPORT

Report Ref: GP0A/AFL/TFW/TRS/02/20/RP1
Date Issued: 11 February 2020
TRS Sample Refs: GP0A01-03
Order No: E-mail (Michael Watkins)

PETROLOGICAL EXAMINATION OF THREE SAMPLES

FROM AFAN LIDO

FOR TERRA FIRMA (WALES) LTD

Thomas Research Services Ltd.
Tel: +44 (0) 1469 532 929
www.slagtest.co.uk
Unit 7, Tattershall Castle Court, Morgan Way, New Holland,
North Lincolnshire, DN19 7PZ, United Kingdom
A Limited Company registered in England. Company Registration No: 2518421

PETROLOGICAL EXAMINATION OF THREE SAMPLES FROM AFAN LIDO FOR TERRA FIRMA (WALES) LTD

1. BACKGROUND

Three samples were received from the above site on 29th January 2020. The samples were weighed and allocated unique TRS identification numbers as follows:-

TRS Ref	Site Ref	Depth/m	Mass/kg
GP0A01	TP01	0.2-0.3	8.6
GP0A02	TP02	0.3	8.8
GP0A03	TP03	0.3	9.0

The purpose of the exercise was to identify any products from iron and steel making operations, and to assess whether there was any risk of potential for volumetric instability from these materials.

2. SAMPLE PREPARATION & PROGRAMME OF ANALYSIS

The three samples were primary crushed to reduce particle size down to <50mm, portions then being selected and dried at low temperature to constant weight. The dried material was subjected to a regime of stage crushing and quartering to further reduce particle size down to <5mm. Portions of this <5mm material were made up into resin bound blocks, one face of which was ground flat and polished using diamond pastes.

Further portions of the <5mm material were milled to a fine powder. Portions were extracted throughout the preparation procedure to provide the necessary test specimens for any tests and analyses that may subsequently need to be carried out.

A petrological examination was made of the polished blocks using reflected light microscopy, the complete findings of which are recorded in appendix A.

3. DISCUSSION OF RESULTS

The samples were similar in composition, but with varying proportions. They consisted generally of acid slag and refractory from heating furnaces and metal smelting, either of copper or iron.

No normal blast furnace slag, basic steel slag or basic refractory material was seen in any of the samples.

The main slag type present was closely associated with silica refractories, which often occurred as macro inclusions within the slag. The slag was fairly dense, with globular pores with little alteration due to weathering.

Other materials present included quartz (mainly sand), alumino-silicate brick, limestone, iron metal, rust, fume, burnt shale, coke, coal and clay.

4. CONCLUSIONS

The following conclusions can be drawn:-

- The samples were similar, consisting predominantly of materials from heating furnaces and metal smelting, either of iron or copper.
- The dominant slag present was acid slag, which was fairly dense and unaltered. Significant silica refractory was present, often as macro inclusions within the slag.
- Other materials present in the samples included quartz, alumino-silicate brick, limestone, iron metal, rust, fume, burnt shale, coke, coal and clay.
- No normal blast furnace slag, basic steel slag or basic refractory material was seen in any of the samples. As such, no expansion testing is recommended on these samples.

Note

These conclusions apply only to the samples tested and may not represent the bulk of the material in the site from which they were taken.

Ian D. Thomas

Ian D Thomas BSc(Hons) **11 February 2020**

APPENDIX A

PETROLOGICAL REPORT ON SAMPLES GP0A 01-03

A petrological examination has been carried out of three samples, GP0A 01 to 03.

Polished blocks were prepared using particulate material, crushed to a nominal size of -5 mm. Representative material was made up into resin-bonded blocks. One face of each of these was ground flat and polished using diamond pastes. In addition, when appropriate, the surfaces were selectively etched with water and 0.1%N HCl in order to help with the phase identification by means of optical microscopy.

The detailed results are given in the accompanying Table.

The samples consist mainly of acid (silicic) slag intermixed with silica refractory material and quartz sand. The refractory particles are often encapsulated and partly assimilated within the slag and affected by its heat. The materials would have been derived from heating furnaces and metal smelting, either of iron or copper. It's difficult to ascertain the extent of copper smelting but this seems very likely.

No normal blast furnace slag, basic steel slag or basic refractory material was seen.

As noted above, the silicic slag is closely associated with the silica refractories which frequently occur as macro-inclusions within it and, as a result of only partial assimilation, give rise to localised variation in silica content. This, as well as mixing with other refractories such as alumina-rich types, gives rise to various mineralogical types.

The main type is relatively dense with globular pores. It consists mainly of iron silicate, fayalite-type phases (variants of R2SiO4 where R is Fe, Mn, Mg, Ca, etc.in solid solution). The iron silicate typically occurs as needle-shaped crystals that may be quite long (up to 1mm) and have a characteristic herring bone texture. The space between the silicate crystals (matrix) is infilled with slag glass that is usually devitrified as extremely small silicate crystals. There are subsidary amounts of iron-rich oxides especially Fe-rich and Al-rich spinels (R3O4 where R is Al with Fe, Mn, Mg, etc.). Sulphides, iron-rich and probably cupriferous, occur in minor amounts as tiny, scattered beads up to about 0.1 mm in size. These are sometimes fringed by oxidation rings of iron oxides and hydrates including,

rarely, delafossite(CuFeO2). As noted above, varying amounts of residual low temperature silica (quartz) and high temperature silica are present as inclusions.

The simplest constitutional type consists of glass that is partly devitrified with feathery crystals of the pyroxene-type phase. Other slag, especially in sample 02, is cindery in appearance. It is typically rich in iron and aluminium oxides and is more finely crystalline.

Other constituents include, quartz (mainly sand), alumino-silicate brick, limestone, iron metal, rust, fume, burnt shale, coke, coal and clay.

TRS SAMPLES GP0A 1, 2 & 3

	1	2	3
BLAST FURNACE SLAG			
Amount	***-***	***-***	***-***
BASIC STEEL SLAG			
Amount	***-***	***-***	***-***
BASIC REFRACTORIES			
Amount	***-***	***-***	***-***
ACID (Silicic) SLAG & SILICA			
Amount	***L***	***L***	***l***
Phases present:-			
Quartz as refractory & HTS	l	l	l
R2SiO4 silicates & matrix	l	m	s
R3O4 & R2O3 phases	s	s	m
RO phase	s	-	-
Metal	vs	-	-
Fe-rich sulphide	s	s	-
Glassy slag	m	-	s
Corundum	vs	vs	-
OTHER CONSTITUENTS			
Alumina refractories	vs	vs	s
Quartz as sand	s	s	m
Limestone	s	-	s
Metal, rust & fume	s	s	vs
Shale, clay & ash	s	s	s
Coke	s	m	s
Coal & char	vs	vs	vs
Cementitious material	s	s	s
Used Portland cement	vs	-	-

L = very large, l = large, m = medium, s = small and vs = very small amounts
HTS High temperature silica
R = Fe, Mn, Mg, Ca, etc.

GENERAL EXPLANATION

L = very large, l = large, m = medium, s = small and vs = very small amounts.

Iron Blast furnace slag When present the usual tye consists mainly of melilite (CaMgAl silicate, ranging in composition between $Ca_2Al_2SiO_7$ and $Ca_2MgSi_2O_7$). Other phases include merwinite ($Ca_3MgSi_2O_8$), larnite (ß-Ca_2SiO_4) and bredigite (Ca_2SiO_4 with some Mg in solid solution). The matrix often consists of some of the above phases, especially melilite, but may also contain other phases such as wollastonite ($CaSiO_3$) and pyroxene ($(CaMg)SiO_3$). Spinel ($MgAl_2O_4$) may be present. The sulphides and metal are mostly finely dispersed, but the metal may occur as prills and contain some graphite and Ti carbo-nitride. The ceramic slag is very finely crystalline. The alteration products include calcite and gypsum but are mostly hydrates difficult to identify specifically under the microscope.

Basic steel slag When present this consists mainly of dicalcium silicate, mostly the ß-form (larnite), RO phase (mainly FeO with some Mn, Mg and Ca in solid solution) and RF phase (complex Ca alumino-ferrites). Other phases include periclase (MgO) and lime phase (mainly CaO with some Fe, Mn & Mg in solid solution). Its alteration products are, again, difficult to identify specifically but are probably, mainly, hydrated silicates.

Basic refractories When present these are mainly magnesian and consist of granular periclase (MgO) with interstitial silicates. Some samples contain chrome-magnesia material with chromite present in addition to the other phases. The periclase and interstitial silicates show secondary alteration similar to that of the basic steel slag.

Acid steel slag This consists mainly of fayalite $(Fe,Mn)_2SiO_4$ and Fe, Mn oxides. The cindery slag consists of various silicates and silicate glass with Fe oxides and hercynite ($FeAl_2O_4$).

APPENDIX B

MECHANISMS OF VOLUMETRIC INSTABILITY IN IRON AND STEEL INDUSTRY SLAGS

Volumetric change with time can occur in some types of iron and steel industry slags. These mechanisms are briefly described in this section.

Blast Furnace Slags

Fresh-make air-cooled, i.e. crystalline, blast furnace slags are almost always volumetrically stable after cooling. The two mechanisms for volumetric instability listed in BS1047:1983 – "Air Cooled Blast furnace Slag for use in Construction" are:-

a) Beta to gamma inversion of dicalcium silicate.

b) Iron unsoundness.

a) Research by G H Thomas on this phase transformation has shown the transformation to be athermal rather than isothermal. In practical terms this means that inversion, and the expansion associated with it, can only occur during the cooling cycle. In fully cooled material there would appear to be no further risk of instability from this mechanism.

b) Iron unsoundness is a very rare form of instability frequently associated with operating problems in the blast furnace. TRS know of only one instance in over 40 years. The mechanism, which is a hydrolysis reaction, is immediately triggered off by the presence of water. Once water has initiated the reaction, the mechanism proceeds to completion. It is impossible to arrest the process once started; at least by methods operating in normal ambient conditions.

It follows that the risk of late expansion from either of these mechanisms in blast furnace slag is remote.

c) Sulphoaluminate Type Activity

Some years ago, G. H. Thomas discovered a third mechanism that may give rise to volumetric instability. The process is possible only in some old blast furnace slag altered by weathering. When the sulphide sulphur in the blast furnace slags is oxidised during weathering to sulphate, under some circumstances reactions can take place within the slag to produce an 'ettringite' type product. The process is somewhat analogous to sulphatic attack on concrete and has a similar result - expansion of the mass and associated disruption.

For the mechanism to have any significance, the slag needs to have residual potential for this reaction. Evidence of past activity does not necessarily indicate further reaction is possible.

The TRS accelerated expansion test is, we believe, uniquely capable of identifying such slags, as well as instability attributable to free CaO and free MgO in steel slag & etc.

Basic Steel Slags

Basic steel slags commonly contain significant quantities of free CaO and free MgO. These free oxides are well known for the massive expansion associated with their hydration. In practical terms, it is impossible to forecast when hydration will take place, but it can be up to decades after the material was cooled – or placed. The reasons are complex, but include the varying density of the oxides, due to the variation in temperatures at which the products have been held in the furnace. Other factors influencing rate of hydration include:-

- the protection of slags by a reaction product at the oxide interface with the slag.

- the presence of the oxides as lime or magnesia rich solid solutions instead of the pure oxide.

The result is potential future volumetric instability but at an unforeseeable date. Periclase, i.e. free MgO, is relatively much slower than free CaO to hydrate.

Scrap High Magnesia Refractories

These are particularly undesirable components in fill as they commonly result in high concentrations of free MgO. The problems associated with these concentrations are similar to those where periclase is found in basic steel slag.

DRAWINGS



terrafirma

Job Number:

14647-1

Job Title:

Afan Lido, Aberavon

Drawing Title:

Exploratory Hole Layout

Drawing Number:

01

Scale:

Not To Scale

Legend:

Trial Pit Location

North



Terra Firma (Wales) Ltd.
Consulting Geo-Technical & Geo-Environmental Engineers
Site Investigation Contractors

5 Deryn Court, Wharfedale Road,
Pentwyn, Cardiff CF23 7HB
Tel: 029 2073 5354 Fax: 029 2073 5433
Email: info@terrafirmawales.co.uk
www.terrafirmawales.co.uk